ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXIV, No. 21. CHICAGO, SATURDAY, MAY 23, 1914. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor
Chester A. Gauss.....Assistant Editor

MEMBER THE SOCIETY FOR ELECTRICAL DEVELOPMENT DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Protection From Lightning.....1005
Increasing the Power-Factor.....1006
Safeguarding the Public in Railroad Electrification.....1007
Equipment for Industrial Plants.....1007
DEPARTMENTS:
Commercial Practice 1017
Electric Sign Data.....1020
Electrical Construction 1021
National Association of Electrical Inspectors.....1026
Public Service Commissions 1030
Questions and Answers 1032
New Electrical and Mechanical Appliances.....1040
Latest Approved Fittings 1045
Current Electrical News 1046
Record of Electrical Patents.....1051
LEADING ARTICLES:
Electricity in Brick Plants.....1011
Circuits for Elevator Signaling 1021
Notes on the Table of Carrying Capacities of Copper Wire.—By W. Lincoln Smith.....1026
Electrical Equipment for Industrial Plants.—By Harry C. Spillman 1034
LETTER TO THE EDITOR:
Percentage System in Electrical Contracting.—By E. M. Raetz 1024
MISCELLANEOUS:
Electrical Supply Jobbers' Association.....1008
Annual Meeting of American Institute Electrical Engineers 1008
S. B. Way 1009
Philadelphia Section, Electric Vehicle Association.....1010
Look out for the Wires.....1017
Prizes for Salesmen Stimulates Business in Louisville....1018
Wakefield Municipal Light Plant to Shut Down.....1018
Columbus Company Co-operates in Obtaining Good Lighting Installations 1019
Increasing Business Makes Extensions Necessary in Pittsburgh 1019
Indiana Contractors to Meet.....1024
Among the Contractors.....1025
Plans Formulated for Work of the Society for Electrical Development 1036
Radiotelephony on Lackawanna Railroad.....1037
Brightness 1038
Mississippi Electric Association 1039
Another Successful Rejuvenation at Dayton.....1039

Copyright, 1914, by Electrical Review Publishing Company, Inc.

PROTECTION FROM LIGHTNING.

We referred in the issue of May 2 to certain phases of the question of securing protection to buildings from lightning. In a paper presented before the Junior Institution of Engineers in England, Mr. F. H. Taylor discusses in some detail the desirable properties of lightning conductors and the tests which should be carried out to determine their fitness not only at the time of installation, but after having been in service The inspection and testing of lightning conductors after having once been installed is usually neglected utterly. This has probably given rise to much trouble, such as is reported from time to time as having occurred in buildings that were believed to have been protected by lightning conductors. Such neglect is entirely unjustified, since the earth connection is of the utmost importance and cannot be relied upon to maintain itself in good condition indefinitely. In this regard it should be remembered that the area of contact is an important element affecting the resistance of any ground connection. The surface contact between conductor and soil will usually form the largest portion of the total resistance. Where copper plates are buried to provide a ground connection, they should be thin in order to give as large a surface as possible for a given mass of copper, and yet not so thin as to be liable to mechanical damage, which will limit the useful surface. Mr. Taylor advocates a vertical rather than a horizontal position for such a ground plate. Where a ground plate is surrounded with broken coke or cinders, with a view to retaining moisture, such material should be thoroughly washed beforehand in order to eliminate any sulphur which might be present and which would attack the copper.

Regarding the choice between iron and copper for a rod, it is usually recognized that either one may be effective. In the case of an oscillatory discharge, iron, by interposing a larger resistance, will cause a more rapid diminution in the oscillations. Iron, however, has the disadvantage that it may become corroded and thereby suffer mechanical damage, due to its loss of strength. Conductors should be kept away from interior gas pipes and electric conduit as much as possible, but external metal work, such as roofs, should be connected to the lightning conductor system.

In many cases lightning conductors are installed by persons unfamiliar with the proper requirements and are consequently inadequate for the desired result of protection. This is especially the case where no de-

tailed specifications are drawn up covering this item of installation for a new building. To secure real protection, such a specification should be gone into with as much detail, if not more, than any other portion of the building. It would seem desirable for electrical contractors to familiarize themselves with the requirements of a satisfactory lightning-conductor installation and endeavor to have this portion of the work included in the electrical contract. There is an opportunity here for men familiar with the nature of lightning and with the latest work which has been done in designing lightning conductors to perform a real service to the builder and building owner.

INCREASING THE POWER-FACTOR.

The general tendency toward increase of individual drive and the use of smaller induction motors in all sorts of motor applications has tended toward a lowering of the power-factor upon both the supply lines of central stations and upon the isolated power plants. Such low power-factors are not only disadvantageous in that larger currents are necessary for the same power, thus requiring either larger capacity in feeder cables and generating equipment or else greater heating, but they also have considerable effect upon regulation. Not only is there a greater drop on feeder and transmission lines with load when the power-factor is low, but the regulation of the generators themselves is affected. The percentage regulation of generators is much larger at low power-factors than at unity power-factor. Moreover, excitation becomes more difficult, as a larger exciting current is necessary, and this item frequently limits the capacity of an alternator at low power-factor. The consequences of low power-factor might be carried into even further detail, such as the lack of utilization of the full capacity of prime movers under such circumstances, but the above effects suffice to show its undesirability.

There are several methods by which the power-factor of a system may be improved, although in this country the use of the synchronous condenser, that is, an unloaded synchronous motor, appears to find greatest favor. The application of this machine for this purpose is constantly increasing. The question of its advisability must be decided in each case, of course, by commercial considerations, the cost of the necessary equipment being balanced against the saving in losses, the saving in capacity of equipment and the improved satisfaction of operation with better regulation.

The power-factor of any synchronous machine can be altered by changing the degree of excitation of the fields. By connecting a synchronous motor to the line, the power-factor of the current taken from the line can be controlled to a certain extent through excitation of this motor. By increasing the excitation, the current may be made to lead the voltage. Since with the ordinary induction motor the current is a lagging one, every contribution to leading current must improve the power-factor, until it reaches unity. By varying the excitation the amount of leading current can be varied and the power-factor regulated within certain limits.

Whether it is preferable to operate such synchronous condensers in a substation at the end of a transmission line or to endeavor to have customers of a supply company make use of synchronous motors will depend upon local conditions. Since in most cases, however, it is difficult to control customer's installations, it is advisable for the sake of having control in its own hands for the supply company to have such apparatus in its own substations. Conditions are especially favorable where such a motor can be used to drive a fairly steady load. The most favorable condition perhaps is obtained by using a machine rated about 50 per cent higher than the actual load to be placed upon it. There will then be available a wattless current about equal to the energy current used.

The synchronous motor does not represent the only method of controling power-factor. In Europe the phase advancer, which is attached to the shaft of an induction motor, is being used for this purpose. This, perhaps, finds its most suitable application in private plants where it is desirable to correct the power-factor at the point where power is being utilized. A modification of this idea is found in the vibrator proposed by Dr. Gisbert Kapp.

Static condensers may also be used for this purpose, especially where it is desired to make local correction of power-factor, and the decreasing cost of such equipment may make it a commercially possible method in the near future. Since about 11 microfarads per kilowatt of load are necessary to entirely compensate a power-factor of 0.75, it will be seen that the expense of this method will be considerable.

The possibility of using a rotary converter to correct low power-factor through overexcitation has been suggested. This method, however, is not so feasible as might at first glance appear. Usually power-factor adjustment is not required upon circuits where rotary converters are installed. Supposing this to be the case, however, the change in excitation will affect the voltage on the direct-current side, especially on account of the drop in the reactance usually placed in the alternating-current leads. In case this voltage is automatically controlled, it is possible to vary the amount of leading current drawn from the supply mains without affecting the direct voltage. This will usually require special design, however, since the heating of the armature is increased when a leading current is created.

Another use of the synchronous condenser somewhat similar to the above and with equally good result in increasing the amount of power which may be transmitted over a given line, is to utilize it in maintaining a constant voltage at the receiving end of a transmission line. In this case, adjustment is made

not to the point of highest power-factor, but to the point of definite voltage. Drawing a leading current from a transmission line tends to reduce the voltage drop along the line and consequently to raise the voltage at the receiving end. With a low load the drop of voltage on the line may even be made negative, so that the voltage at the receiving end exceeds the voltage at the supply end. Under ordinary circumstances, in order to maintain a constant voltage at the receiving end of the line the voltage at the generating end must be increased when the load increases. This produces a variable voltage at intermediate points which may be very objectionable. By using the synchronous condenser to maintain constant voltage at the receiving end it is possible to adjust at the generating end for constant voltage there and thus greatly improve voltage conditions along the entire line. This makes it possible to feed a higher load over the transmission line without a prohibitive variation in voltage and thus attains the same object as an improvement in the power-factor. In systems having long transmission lines where the cost of copper is one of the main items of investment, operation for constant voltage may be the best method of utilizing synchronous condensers.

It must be remembered that the advantages obtained with the synchronous motor are not without some cost, in addition to that represented by the initial investment. While the current taken by the motor is leading, it must have a sufficient energy component to provide for the iron and copper losses in its own armature, windage and friction, and in addition current must be supplied for its excitation. This energy consumption, while not large, is nevertheless very appreciable. Thus for a circuit delivering 1,000 kilowatts at a power-factor of 0.75 per cent, a machine would be required drawing 880 wattless kilovolt-amperes, in order to bring the power-factor up to 100 per cent. This would mean a motor with a capacity of 880 kilowatts, in which the losses would probably reach 60 watts when running loaded. At times of low load this loss would diminish, but it, in addition to interest on the cost of the machine, must be included in the estimate of expense for improving the power-factor.

SAFEGUARDING THE PUBLIC IN RAILROAD ELECTRIFICATION.

A praiseworthy campaign of education has recently been inaugurated by the New York, New Haven and Hartford Railroad for the protection of the public in the electric zone in southwestern Connecticut. It was planned by the company to energize the entire overhead system between Woodlawn and New Haven on or about May 15, and as the territory east of Stamford and Westport had not until that date received full electric service, it was felt by the management to be important to give the public some practical suggestions along the line of preventing accidents due to carelessness and the small boy's innate love for deviltry. To this end a great number of newspapers in the district were supplied with a well prepared article pointing out the results liable to follow tampering with the overhead systems by mischief makers, and in addition the company has been in communication with mayors, fire-department officials and other authorities in the municipalities between Stamford and New Haven, seeking their co-operation in trying to instill caution in the minds of the public and particularly to restrain the rising generation from imprudence in the vicinity of the tracks, catenary and feeder lines. The precautions suggested are capable of modification by central-station and transmission companies in many localities and in view of their technical accuracy and popular diction are reprinted in full on another page of this issue.

EQUIPMENT FOR INDUSTRIAL PLANTS.

The advantage of designing the electrical equipment for industrial plants at the time the building is laid out and before construction has started is pointed out in an article by Mr. H. C. Spillman in this issue. In this respect the factory building is no different from the residence, the store, the office, etc. In every case the best results from the utilization of electrical equipment can only be obtained when it is designed as an integral part of the building and when the wiring is so arranged that the outlets are found to be in the most convenient place when the time comes to attach current-consuming devices.

In the case of the factory, however, more is involved than proper provision of conduit capacity and outlets. The entire system should be decided upon in advance and not only the type of equipment and its location fully determined, but arrangements for distribution fully worked out. Where current is purchased it is frequently necessary to have a small substation upon the premises of the consumer, and unless space is provided for this in the original building plans, there is likely to be difficulty later through the compromise of efficiency and convenience to suit the conditions which are imposed by the completed building. Where a private power plant is to be installed, careful consideration is necessary in determining upon the most suitable voltage, etc.

In considering the power requirements, it is, of course, necessary to have the entire electrical drive designed and provision must then be made for losses and an estimate formulated as to the power which will actually be used. Mr. Spillman gives some data on this subject which are of special value on account of the scarcity of reliable information on this point.

The choice of control equipment, the method of mounting motors and various other details should all be decided upon in advance and then the electrical equipment can be installed as an integral part of the complete plant, and will not look like an afterthought, with the accompanying detriment not only to the appearance but probably to the efficiency and usefulness of the apparatus.

Electrical Supply Jobbers' Association.

The regular quarterly meeting of the Electrical Supply Jobbers' Association was held at the Hotel Chalfonte, Atlantic City, N. J., from May 12 to 14, 1914. About 65 members of the Association were present. Two executive sessions were held daily, beginning at 11 a. m. Tuesday, May 12. There were no open meetings. Much time of the meeting was devoted to a discussion of referendum instituted by the National Chamber of Commerce, relating to the pending Trade Commission Bill. The Association voted in favor of all propositions except No. 3. The question of the electrical trade's status in reference to rubber-covered wire was also discussed.

On Wednesday evening a dinner, entertainment and rejuvenation of the Jovian Order was held at the Hotel Rudolph. This was in charge of J. C. Vogel, statesman-at-large, together with R. L. Cunningham, stentor, and A. B. Young, comedian. These gentlemen were assisted by the Philadelphia Degree Team.

Among those in attendance were the following: H. C. Adams, Jr., W. J. Anderson, H. P. Andrae, A. I. Appleton, George N. Beatty and Mrs. Beatty, C. Baker, W. K. Beard, H. D. Betts, A. Hall Berry, Thomas H. Bibber, E. G. Bernard, W. S. Bissell, F. V. Burton, L. L. Brastow, H. G. Buckmeister and Mrs. Buckmeister, J. F. Bevins and Mrs. Bevins, James Brown, W. S. Brown, C. E. Browne, William K. Browne, J. A. Burke, S. A. Chase, J. H. Cook, Robert B. Corey, C. E. Corrigan, H. B. Crouse, S. B. Condit, Jr., H. H. Cudmore, W. G. Campbell, Judge T. M. Debevoise, W. M. Deming, V. R. Despard, L. O. Duclos, B. M. Downs, A. P. Eckert and Mrs. Eckert, G. W. Elliott, J. J. Eleson, W. R. Frazer, L. V. Garrison, L. V. Garron, William Gloeckner, R. D. Gloeckner, H. J. Gorke, E. C. Graham, H. S. Greene, E. F. Grier, Thomas G. Grier, G. B. Griffin, H. Griffin, A. L. Hallstrom, R. Howland and Mrs. Howland, Charles A. Harding, F. S. Hardy and Mrs. Hardy, N. G. Harvey, E. B. Hatch, W. R. Herstein, C. L. Hight, F. C. Hodgins, R. H. Harper, P. H. Hoover and Mrs. Hoover, J. H. Hughes, C. P. Hill, A. F. Hills, H. H. Hornsby and Mrs. Hornsby, H. O. Jones, E. A. Jenkins, J. Joseph, J. G. Johanneson, E. B. Kittle, C. H. Kelly, P. S. Klees, W. Kindner, W. W. Low and Mrs. Low, Ray D. Lillibridge, C. H. Litscher, W. J. Leveridge and Mrs. Leveridge, D. H. Murphy, H. P. Moore, F. D. Masterson, Shiras Morris, H. C. Moran, G. E. McGuire, J. R. McNaughton, S. F. McFedries, W. W. Merrill and Mrs. Merrill, M. McGraw, S. C. Nicholson, W. A. Oberlander, Percy Oblinger, W. H. Onken, Arthur Organ, Thomas O'Brien, Franklin Overbagh, H. T. Paiste, McKew Parr, A. E. Pollock, George L. Patterson, John Perry, A. D. Page and Mrs. Page, J. H. Parker, J. A. Pizzini, I. M. Post, F. S. Price and Mrs. Price, George W. Provost, W. T. Pringle and Mrs. Pringle, E. W. Rockafellow, James Richardson and Mrs. Richardson, J. H. Rogers, H. C. Rice, W. L. and W. T. Sinnot, L. A. Schwab and Mrs. Schwab, Charles P. Scott, B. E. Salisbury, W. S. Sisson, G. S. Smith, B. H. Scranton, Charles J. Stahl and Mrs. Stahl, Frank Stout, F. E. Stow, W. V. Stuart, A. S. Terry, W. R. Thomas, John M. Trumbull, J. D. Underhill, J. C. Vogel, F. D. Van Winkle, J. B. Ward, T. G. Whaling, James Wolff, M. B. Wheeler, E. W. Wilkins, E. Whittemore and Mrs. Whittemore, J. A. Worth, H. R. Worthington, H. E. Watson, and Elmer E. Wood.

Columbia School of Mines to Celebrate Founding of School.

The largest gathering of graduates of Columbia University in its history will be seen on May 29 when the alumni of the School of Mines meet on Morningside Heights to celebrate the fiftieth anniversary of the founding of the technical school. Invitations have been issued to all alumni of the university and the number of acceptances is larger already than for any previous celebration at the university. Elaborate plans for the entertainment of the guests have been made by the committee in charge, and the celebration will begin on the night of May 28 with a reception in the gymnasium followed by a dance. On the morning of May 29, there will be a convocation in the gymnasium at which President Nicholas Murray Butler will preside. J. H. Van Amringe, ex-dean of the college, will present candidates for honorary degrees, and there will be addresses by T. A. Richard and Henning Jennings. In the afternoon the first lecture in the Chandler Foundation will be given by Dr. L. H. Baekeland; and in the evening there will be a banquet at the Waldorf-Astoria Hotel, at which well-known alumni will speak and at which there will be many novel and enjoyable features.

Utah Society of Engineers.

The regular monthly meeting of the Utah Society of Engineers was held on May 15, in Consolidated Music Hall, Salt Lake City, Utah. S. E. Park, engineer of the Utah Gas & Coke Company, of Salt Lake City, read the principal paper of the evening on the subject "Coal Gas Production."

Annual Meeting of American Institute of Electrical Engineers.

The annual meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on the evening of Wednesday, May 20. The tellers of election made their report, as the result of which the following officers were declared elected for the year beginning August 1.

President: Paul M. Lincoln, Pittsburgh, Pa.

Vice-Presidents: F. S. Hunting, Fort Wayne, Ind.; N. W. Storer, Pittsburgh, Pa.; Farley Osgood, Newark, N. J.

Managers: Frederick Bedell, Ithaca, N. Y.; Bancroft Gherardi, New York City; J. H. Finney, Washington, D. C.; A. S. McAllister, New York City.

Treasurer: George A. Hamilton.

The Board of Directors presented a report covering the activities of the Institute during the year ending April, 1914, and showing the finances to be in good condition.

A technical session was then held under the auspices of the Committee on the Use of Electricity in Marine Work. The first paper was by H. L. Hibbard, and was entitled, "Electricity, The Future Power for Steering Vessels." This was discussed by George A. Pierce, Jr., Mathias Pfatischer, Maxwell W. Day, and R. A. Beekman.

H. J. Mauger then presented a paper entitled "The Future of Electric Heating and Cooking in Marine Service." This was discussed by W. S. Hadaway and E. F. Dutton. A full report of the technical session will be given in our next issue.

New York Electrical Society Meeting.

At the meeting of the New York Electrical Society to be held on the evening of May 25, at Havemeyer Hall, Columbia University, there will be two addresses. L. A. Bauer, director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, will lecture on "The Magnetic Survey of the Whole Earth." John C. Porte, lieutenant in the Royal Navy, will give an address on "Aerial Navigation," with especial bearing upon the Rodman Wanamaker transatlantic flight.

Massachusetts street-railway companies have petitioned for legislation to put them on par with steam roads in issuing bonds. Under the present law a street railway whose stock is selling below par is denied the right to issue additional stock and in consequence is unable to secure money for development.

S. B. Way.

The opinions of the pessimists to the contrary, there appears to be today just as great an opportunity as ever there was for men of ability to advance rapidly in their chosen professions, providing they are endowed with the mental, physical and moral attitudes which make for success. In that department of electrical engineering that has to do particularly with central-station development, it has been demonstrated time and time again that the avenue of approach for the hard-working, intelligent and courageous man is not only wide open, but lined with helping hands extended to those who make the effort to travel its length, unknowing what the end may bring.

In the short span of 16 years it is something to have progressed from the position of draftsman to that of ranking officer in one of the largest public-utility corporations in the country today.

All of which is apropos of the election of S. B. Way to fill the position of general manager of the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company. The selection of Mr. Way to fill this important position is a well merited recognition of sterling qualities and ability, and one that meets with the hearty approval of every employee of the company and carries with it the sincere and cordial wishes for continued success from a host of friends and acquaintances throughout the country.

Mr. Way is 39 years old. He received his technical education at Drexel Institute, Philadelphia. After graduation he began his business career in the employment of the Electric Storage Battery Company of Philadelphia, as a draftsman, shortly thereafter becoming an erecting engineer for the company. He left that organization in 1898 to accept a position as electrical superintendent with one of the relatively early electric lighting and power companies in St. Louis, which later on became the present Union Electric Light & Power Company, the principal electric utility of that city. Mr. Way remained in the service of the Union Company at the head of the largest department of the organization until he went to Milwaukee, in November, 1911, as assistant general manager. Early in 1912 he was elected vice-president of the company.

Mr. Way is also actively interested in the management of the Wisconsin Gas & Electric Company, of Racine and Kenosha, the Watertown Gas & Electric Company, of Watertown, Wis., the Burlington Light & Power Company, of Burlington, Wis., and the North Milwaukee Light & Power Company, of North Milwaukee, Wis. These properties, with the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company constitute the Wisconsin Edison Company, one of the big underlying properties of the North American Company. In the absence of James D. Mortimer, president of the company, Mr. Way will be ranking officer.

S. B. Way,
General Manager of the Milwaukee Electric Railway & Light Company.

Philadelphia Section Notes.

The Philadelphia Electric Company Section, National Electric Light Association, set aside Monday evening, April 20, as "Philadelphia Night." The speaker of the evening was Edward J. Cattell, statistician of the City of Philadelphia, and the title of his discourse was "Philadelphia, Past and Present."

The April meeting of the Accounting Department Branch was held on April 14. It was strictly for jollification and was designated as "Ladies' Night." A vaudeville and motion-picture bill of 12 numbers was presented, the feature of the evening being a "Mock Trial" by members of the Branch. The music of the evening was furnished by the Peconela Orchestra under the leadership of Joseph G. Johnson.

A combination meeting of the Engineering and Commercial Departments was held on the evening of April 27. The paper of the evening was "The Industrial Future of Philadelphia" and was delivered by George S. Webster, chief engineer and surveyor, Department of Public Works of Philadelphia.

The April meeting of the Meter Department Branch was held on the evening of April 3. "Modern Astronomy" was the topic of the evening. The paper was delivered by Harry J. Malgrave, Jr. The usual luncheon was served and music furnished by the orchestra.

Railway Convention to Be at Atlantic City.

The 1914 Convention Committee of the American Electric Railway Association, acting with the Committee of the American Electric Railway Manufacturers' Association, has decided upon Atlantic City as the location for the 1914 convention of the Association. The dates are October 12 to 16.

The decision of the Committee was arrived at only after a very careful investigation of several other suggested locations. Boston and Washington were the leaders among the other applicants, but neither of these cities could furnish the accommodations required at the time required

The Association's conventions are growing so large that both from the standpoint of hotel accommodations and a place to house exhibits, available locations are each year growing fewer. It is known that Atlantic City can take care of the conventions and the history of the Association shows that conventions held in Atlantic City have been uniformly successful. Last year's arrangement at Young's Million Dollar Pier was admirable and with the prospect of the use of even more floor space this year, it is necessary that ample room be provided for the exhibits of manufacturers.

Telephone cables containing as many as 900 pairs of wires are now put into about the same size of lead sheath originally used for 50-pair cables.

Philadelphia Section, Electric Vehicle Association.

The May meeting of the Philadelphia Section, Electric Vehicle Association of America, was held on May 13 in the Philadelphia Electric assembly room. The paper of the evening was by F. E. Whitney, entitled "Some Investigations of Electric Vehicle Tires."

The presentation of this instructive paper was illustrated with lantern slides and practical demonstrations of the methods of test. Exhibitions of several kinds of tires were made. The point was brought out that the most efficient tire was the one that embraced in a moderate way all of the good points desired, namely: long life, resiliency, toughness, elasticity, etc. It did not always turn out that the most resilient tire was the one that lasted longest or gave in the end the most economical results. Mr. Whitney stated that now he, representing the vehicle manufacturers, had given to the tire manufacturers the requirements asked for; it was up to the tire manufacturers to produce the desired result. A short discussion followed the reading of the paper.

Chief Walker of the Department of Public Safety was present and entertained the meeting with his experiences in the introduction and use of the electric fire engines in the department over which he has supervision. He told how in a number of cases, the electric engine had broken all records formerly made towards getting to a fire after an alarm was sounded. One case in particular where the former time for a run had been 22 minutes, the electric apparatus had made the run in 11 minutes and 7 seconds. He stated that his experiences had demonstrated that the storage-battery electric engine had proven perfectly practicable in both good and bad weather for fire-department purposes. Last winter when the snow was up to the level of the top of the fire plugs, two-horse-drawn engines had been unable to get to the plug, while the electric engine pulled right up to it without trouble. There are at present three electric fire engines, two high-pressure hose carts and two gasoline-electric trucks in the Philadelphia Fire Department service.

On motion, a committee was appointed to visit the Philadelphia postmaster for the purpose of calling his attention to and endorsing the use of electric trucks in the parcel-post service.

Electric Vehicle Association Rapidly Growing.

At the time of the last convention in Chicago, the Electric Vehicle Association of America had 437 members. At this writing over 650 members are enrolled, an increase of over 200 members, or at the rate of about 600 a year. It appears that by the time of the next convention, to be held in Philadelphia during October (the exact date to be announced shortly) that the 1,000 mark will have been reached—the membership being better than doubled in one year!

It will be interesting to note also that last year only two sections (New England and Chicago) existed. Now sections are organized in New England, Chicago, Philadelphia, Washington, Cincinnati, and San Francisco, the last two sections being very recently added. It is expected that by the time of the Philadelphia convention the present six sections, representing a growth of 300 per cent in about six months, will have increased to about twice that number.

Meeting of Chicago Electric Club.

R. E. Goodell, in charge of the Chicago Bureau of Public Efficiency, was the speaker at the meeting of the Electric Club of Chicago on May 14. Mr. Goodell outlined the work of the Bureau, which is maintained under the auspices of the City Club and which is financed by private subscription. He said the Bureau was really established to carry on the work started by the Merriam Commission of the Chicago City Council, which automatically went out of existence in 1911. The Bureau has made extensive investigations of the affairs of the county administration and has published reports on this subject. General investigations have also been made and reports submitted on the Municipal Court Act; the proposed purchase of voting machines; report on the growing cost of elections; and several reports on the Park Commissions. Concerning the latter, Mr. Goodell stated that these Boards of Commissioners were in a measure duplicating each other's work, with the resultant financial burden on the tax payers. Investigations also disclosed the fact that there are 19 separate and distinct taxing bodies having the power to levy taxes on the citizens of Chicago. Mr. Goodell explained that the Bureau is governed by a Board of Trustees appointed by the City Club and all official reports must be passed upon by this body.

Utah Electric Club.

At the regular luncheon meeting of the Utah Electric Club held at Salt Lake City, Utah, on May 14, Stephen H. Love, president of the Commercial Club Traffic Bureau of Salt Lake City, delivered an address on the subject "The Regulation of Public Utilities." Mr. Love has led the fight for the reduction of freight rates to the intermountain territory before the Interstate Commerce Commission, and has an intimate knowledge of this important subject.

Meeting of New England Section.

The spring meeting of the New England Section of the National Electric Light Association was held at the New American House, Boston, Mass., Friday evening, May 8, with an attendance of over two hundred members and guests.

The first speaker of the evening was Frederick P. Fish, of Boston, who has been in the electrical business since its beginning. He spoke of the early days when what is regarded now as apparatus of so small capacity as to be entirely inefficient and unusable was thought to be the largest that could possibly be manufactured. From his description of these small beginnings Mr. Fish traced the development up to the great enterprises of the present day and spoke of their importance in our economic development. His next step was to emphasize the economic efficiency of the well regulated monopoly in the electrical business and referred in complimentary terms to a number of the public-service commissions, of which the Massachusetts State Gas & Electric Light Commission is the oldest.

Continuing on this subject, he said in part: "You cannot have two like companies in the same vicinity without waste, and where there is waste it is generally at the expense of the common people. Thus a corporation must have exclusive rights in a district, for the best interests of the people as well as for the best interests of the corporation."

Mr. Fish maintained that large public-service corporations should be encouraged by the people and the government, instead of being restricted and in many cases tampered with until they were ruined. He predicted that if the people did not soon begin to realize the value of the large public-service corporations and treat them fairly, many of them would be in the condition of the Boston & Maine and the New York, New Haven & Hartford railroads. Such failures must be paid for with the money of the common people, according to Mr. Fish, for he said that they are the persons who furnish the greater amount of the capital for these large corporations.

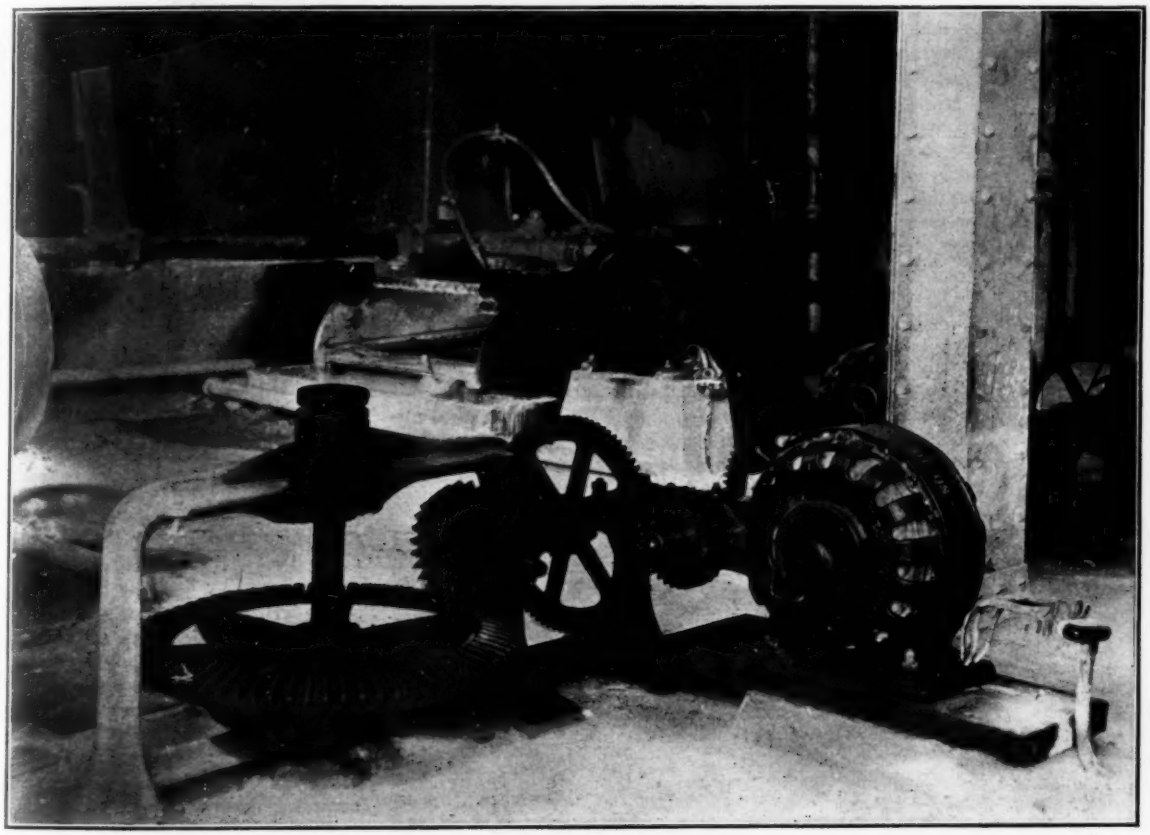
Kansas City Electric Club.

A frolic will conclude the year's work of the Kansas City Electric Club. While the last business meeting of the organization will be held on May 26, a picnic will take place on June 6. The Soldiers' Home and its spacious grounds at Leavenworth, Kans., have been selected as the scene of the outing by A. P. Denton, of the Denton Engineering Company, who is in charge of arrangements.

Electricity in Brick Making.

Although the extent of the economies which can be effected by the application of central-station service to brick-making plants depends to some degree on the method of drying employed, there are comparatively few plants that cannot profitably use electric drive with purchased power. Data on drying methods and motor requirements are given in this article.

While the application of electric power to industrial service is comparatively recent, it has already won recognition and is making rapid progress. Manufacturers of steel were the first to recognize and make use of the considerable advantages obtained by driving machinery electrically, and this industry now consumes more electrical power than any other. Since the first moves toward the industrial application of electricity were made in steel mills, other industries have followed the example and now practically every recognized industry, cement, textile, mining, metal-working, clay-working, etc., use electrical power for the manufacture and transportation of a very large proportion of its product.



Back-Geared Motors Driving Agitators and Sifters in Brick Plant.

The manufacture of brick and tile is probably the oldest of all industries, dating back to early Biblical periods. It would seem, however, that the antiquity of the industry had not brought about a complete knowledge of the possibilities of scientific manufacture and management, for it was not until a few years ago that the clay-working industry departed from methods which had been in use for hundreds of years. The first steps toward electrically operated clay-working plants, and therefore the possibility of economically operated plants, were probably made because of the solicitations of central power plants desiring to sell power. It has been upon the service and publicity of central power plants that the extension of electric drive in clay-working plants has been dependent. This has been because of the fact that the power requirements of such plants are usually of such amounts that a power plant, generating a small amount of power for one consumer cannot make it as cheaply as a central power company, generating a large amount of power for a number of consumers, can sell it.

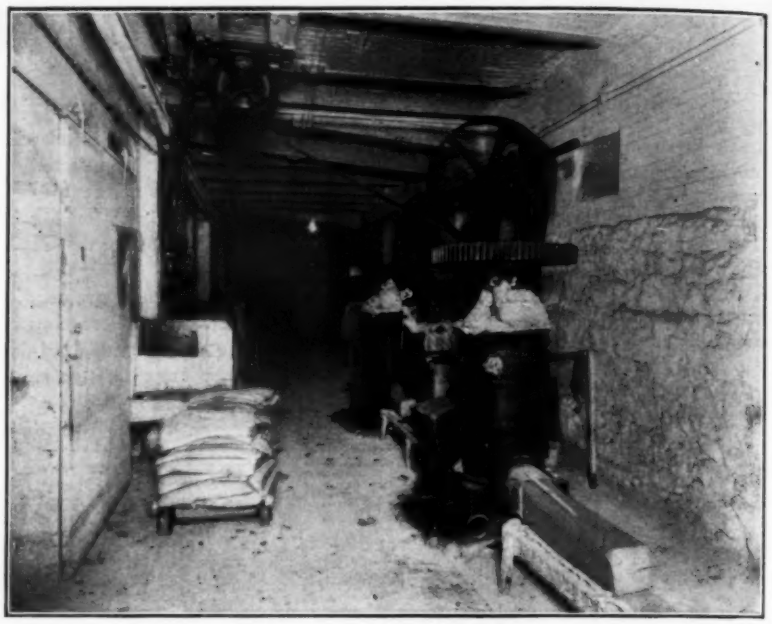
Within the past few years, the territory served by central power companies has increased to a large extent, and in most localities the clay-worker, with a plant making 25,000 to 100,000 brick per day, can buy electrical power at a rate which will allow the manufacture of product more cheaply than ca be secured by any other means of production.

The selection of the means of securing power for a large brick plant, making several hundred thousand brick per day, or a smaller one, which is located so that it cannot obtain a favorable power rate from a central station, is problematical and one which needs complete investigation as to railroad facilities, water, coal, and cost of attendance, before making a decision as to power installation.

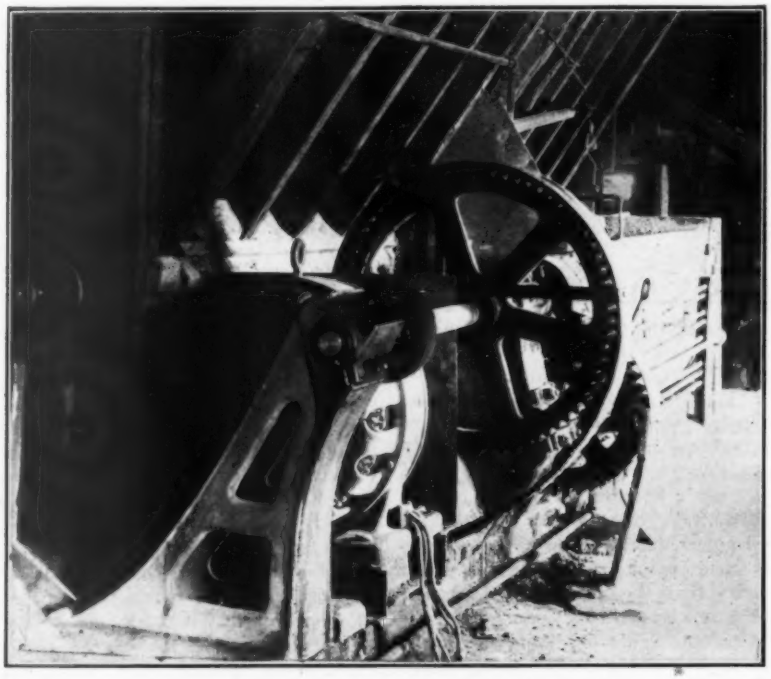
In the consideration of the equipment of an existing plant, which has already some other method of drive

than electrical drive, there are a number of factors that require careful consideration in comparing power costs. In plants operating with permanent kilns, the waste heat from which can be utilized for drying, electric power offers advantages over the central engine drive in many cases. One saving in particular, is in regard to the operation of the blowers and exhaust fans which have to be in service continuously 24 hours a day when there is a charge in the kilns. As the main portion of the plant is operated only during the day time, or approximately 10 hours, it is quite an expense to provide steam power for the engines to drive the blowers and fans the remainder of the 24-hour period. With electric drive, however, this work can be accomplished at a minimum expenditure of energy and cost, as all departments of the plant, with the exception of the kiln department, can be shut down during the greater portion of the time. When temporary kilns are used, it is necessary to provide steam for the drying process and consequently it is necessary to operate a portion of the boiler plant during the period when the other portions of the plant are idle. This condition necessarily reduces the advantage offered by motor drive to some extent, but even in this case motor drive will compare favorably with steam engine drive from a power cost standpoint, and the other advantages as noted previously result in increased output at lower costs.

With the installation of a central power plant and temporary kilns, the plant is subject to the same disadvantages as noted above, that is, a portion of the boilers have to be in operation when the remainder of the plant is shut down for drying purposes. This disadvantage, however, is about on an equal basis no matter what method of drive is selected, and when the advantages for electric drive, as noted below, are taken into consideration, any other method of drive than electric drive is seen to be working at a disadvantage.



Motor Driving Two Pug Mills in Brick Plant.



40-Horsepower Motor Driving Pug Mill.

The clay-working industry is similar to many others in that the future depends largely upon the economies and refinement of manufacture.

The many advantages and the great resourcefulness of electricity have been important factors in making progress along these lines and afford:

(1) More economical arrangement of plant. By the application of individual motors, the various departments of the plant can be located and arranged to the best advantage for operating without the limitation of arrangement as imposed by any other method of drive which requires belt connection.

(2) Increased ouput. When the various machines or departments are operated by individual motors there is a greater assurance of continued operation as compared with a central engine drive, in which case, engine trouble means a shut down of the entire plant. Motors also maintan practically a constant speed throughout their operating range, which results in an increased production as compared with a plant driven by a single engine where the speed varies not only with the boiler pressure, but also with the variation in load. Also the most practical method of drive for auxiliary apparatus such as brick-setting machines, haulage locomotives and other traveling machinery is by means of electric motors.

Electric motors are of simple construction and even for the most severe classes of service are very durable. Due to the fact that they can be applied at the closest position relative to the driven machine, the connecting apparatus such as belts, gears, etc.,

Motor Driving Pumps in Brick Plant.

are reduced to a minimum. Fuses or circuit-breakers are installed in the motor circuits as a protection against severe overloads, such as caused by clogging of the various machines which might cause damage to the motor and the driven apparatus. The possibility of shut downs, due to machine breakage, is thereby greatly reduced.

Clay possesses the characteristic property of plasticity by virtue of which, when subjected to a deforming pressure and the pressure removed, it preserves the shape of the mold. The degree of plasticity can be varied by tempering or adding in suitable quantities water and sand, sawdust, ashes or other inert material. The further manipulation then falls under one of four general methods: hand molding, stiff-plastic, semi-plastic or dry methods, each of which, with the possible exception of the first, permits of the advantageous application of electric power. The stiff-plastic process is generally regarded as the best and most economical where the nature of the raw clay makes its use possible.

In up-to-date plants equipped for electrical operation throughout, a great variety of motor applications is found. The clay or shale is excavated by means of electrically operated shovels and loaded into transfer cars hauled by an electric yard locomotive, to stock piles where, under action of rain and frost, it is weathered and partially disintegrated. From the stock piles the clays, especially the harder shales, are transferred to the motor-driven roll crushes or dry pans, and screens, and then by cup conveyors to the pug mill. From the pug mill the now thoroughly mixed and tempered mass is delivered to the auger brick machines where it is forced through dies carefully designed to produce a true cross section with maximum uniformity of density, in the form of a continuous rectanglar column. A frame carrying tightly strung piano wires or suitable knives rotating at the proper speed, cuts the issuing column of clay into standard sized blocks or bricks.

The green bricks are carried by a belt conveyor, which moves somewhat faster than the column issuing from the auger and consequently separates the bricks slightly, to the represses where they are forced into molds and subjected to heavy pressure. This operation smooths the surface and squares up the corners. The brick is now ready for the drying house and kiln.

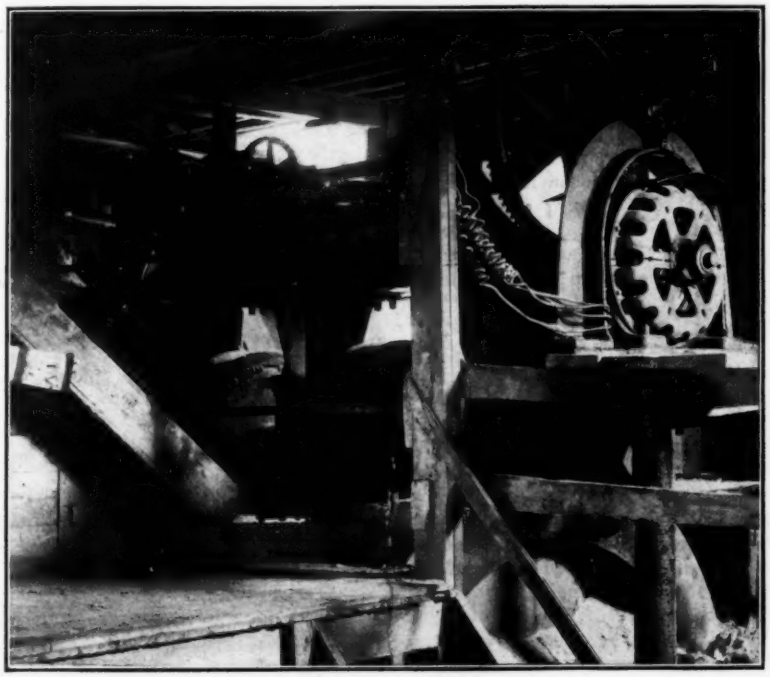
From the central-station standpoint, the opportunity to sell power to brick plants depends almost entirely on the method of drying employed.

In addition to sun drying there are three general methods used, depending to some extent upon the condition of the clay. These three methods are steam drying, waste heat and direct heat.

If the drying of the brick is to be done by steam, generation of energy at the plant often proves more economical than purchased energy, although several factors other than actual coal consumption must be considered. Numerous plants, however, have found it profitable to purchase power, although using steam for drying.

Without doubt the most economical and efficient methods of drying brick is the hot air system which uses waste heat from the kilns. Motor-driven fans draw the hot air and gases from the kilns to the dry rooms. Usually an auxiliary furnace is employed with this system.

When this method of drying is employed, central-station power will, in every instance, effect a considerable saving. The accompanying table shows the results of tests conducted on four



40-Horsepower Motor Driving Dry Pan.

drying plants, two using exhaust steam and two using waste heat. The increased efficiency of the latter is at once apparent.

Regardless of methods of drying, however, another factor which dictates the adoption of central-station power is the temporary nature of most brick plants. Usually, when the workable supply of clay is exhausted, plants shift their location to more desirable points. If this policy is adhered to it would, of course, be impossible to maintain an isolated plant with any degree of efficiency. Also, the actual cost of foundations, boiler setting, etc., would in many cases equal the cost of purchased power.

The machinery required and the methods adopted in the manufacture of bricks are governed largely by the nature of the raw material available and the desired character of the finished product. For the most part, a careful selection from the great variety of standard motors built for general industrial service will fully meet the requirements of clay-working machinery. The range of so-called standard motor design is so great, however, that when new installations are contemplated, it is often to the advantage of the customer to take up with the manufacturer the requirements of each proposed application.

In general alterating-current induction motors fully meet the requirements of clay-working machinery. They are of simple construction with large overload capacity and have no wearing parts except the bearing or slip rings, which in every case are of ample design. The particular form of induction motor to use will depend upon the capacity of the distributing system and service characteristics, including such considerations as frequency or starting, starting torque, continuous or intermittent operation, reversal, etc.

For dry pans, sanders, conveyors, fans, bucket elevators and other machines with similar requirements the standard induction motor with short-circuited bar-wound rotor is usually entirely satisfactory. Each of these applications involves continuous duty at constant speed together with relatively easy starting conditions and no occasion for reversal of direction of rotation. On the other hand, for pug mills, augers, tempering wheels, hoists, excavating shovels, etc., where frequent starting and reversal variable-speed requirements and excessive starting torque are encountered, the induction motor with phase-wound rotor and external secondary resistance, is in general recommended. This form of motor with variable secondary resistance is designed to secure maximum torque with the least possible shock to the supply system when starting under full load.

When for any reason direct-current apparatus must be used, motors with compound windings should always be specified, except for driving fans, for which service shunt-wound motors are suitable. Where the service requirements are similar to those outlined for the induction motor with short-circuited bar-wound rotor, the direct-current motor should have the standard amount of series winding; where the induction motor with phase-wound rotor would be suitable for alternating-current service, the direct-current motor should have approximately 40 per cent of series winding and commutator and bearings should be properly protected from grit and flying mud.

If motors are geared or belted direct to any of the large machines without the use of friction clutches they should be designed for a high starting torque since when starting any of these machines full of clay a very large torque is required. Either induction or direct-current motors may be designed to meet these requirements. If friction clutches are used the motors may be started light and the load thrown on later, but this introduces another piece of apparatus subject to wear and trouble and should be avoided where possible.

The direct-connected motor drive makes the most compact and efficient layout, but care must be taken to see that none of the laws of mechanics are violated; that is, that the foundations are solid, that gears are not run at too high speed, that they are well supported in bearings and rigid, and that the motor is not subjected to severe vibrations. The motors are not injured by the clay and dust, and if the mechanical application is well made a satisfactory drive is assured.

As to the horsepower required to drive the various machines used in the brick-making industry, the following motor sizes are the average taken from several similar installations all of 100,000 bricks capacity per day.

Machine.	Horsepower.
Electric locomotive	30
Hoist	20
Dry pan	30
Elevator	10
Pug mill	50
No. 65 auger	90
Repress	30
Transfer car	10
Brick-setting crane	25

Additional data are given in the following table:

Machine.	Horsepower.
No. 1 Horizontal clay steamer, 20 by 10-inch	10
Eagle D. M. brick press	5
No. 42 D. M. brick press	5
R. 2 brick repress	5
No. 33 roofing tile press	8 to 15
No. 39 roofing tile press	5
No. 46 roofing tile press	4
American Clay Machinery Company.	
Model.	
B-4 mold press-brick machine	10 to 12
C-4 mold press-brick machine	10 to 12
D-3 mold press-brick machine	10 to 12
D-4 mold press-brick machine	10 to 12
2 and 3 mold press-brick machine	8 to 10
American Clay Machinery Company, Auger Brick Machines.	
No. 1 giant	40 to 60
No. 2 giant	25 to 30
No. 6	15 to 20
No. 8	25 to 35
No. 10	30 to 50
No. 15	75 to 100
No. 41	30 to 50
No. 43	35 to 40
Acme	20 to 25
Centennial	20 to 30
Mascot	10 to 12
Special Giant	75 to 100

Accurate figures covering cost of electrical operation are difficult to obtain owing to the widely varying factors influencing production. Records from several plants with a daily capacity of from 50,000 to 100,000 soft-mud sand-molded bricks, indicate a fair average of 15 to 20 molds of six bricks each per minute or from 90 to 100 bricks per kilowatt-hour for all electrical power consumed. Plants using the stiff-plastic method show approximately the same output per kilowatt-hour energy expended in brick machines proper. One plant of 156,000 daily capacity shows a power consumption of 1,700 kilowatt-hours per day for its auger brick machines. Another plant, with a daily capacity of 200,000 common bricks, shows for two successive months an average monthly output of 4,700,500 bricks at an average expenditure of 45,600 kilowatt-hours in driving its auger machines. Where the change from steam engine or other form of mechanical power has been made, an estimated saving in operation expense of from 20 to 30 per cent has often been effected.

While the total power required, including auxiliary devices, varies from 12 to 18 kilowatt-hours, a conservative estimate of power required by pug mills and augers is about 1.5 horsepower per 1,000 bricks per 10-hour day, or 11 kilowatt-hours per 1,000 bricks.

Data on several typical brick-making plants purchasing energy from central-station companies are given in the accompanying sheets.

	Steam Dryer, Natural Draft.	Steam Dryer, Forced Draft.	Hot Air, Natural Draft.	Hot Air, Draft. Forced
Capacity of dryer (bricks)	390,096	390,280	175,560	544,320
Brick dried in 36 hours	373,000	395,000	219,000	362,880
Outside temperature—Fahrenheit	33°	20.5°	25°	34°
Temperature of emergent air—Fahrenheit	121°	154°	108°	128°
Average mean temperature of dryer	106	119.5	88.80	117
Average relative humidity, per cent	29	26	70	67.1
Average grains of moisture per cubic foot	15.5	16.9	14.2	20.6
Volume in cubic feet	78,678	112,028	126,595	537,156
Average moisture taken from brick, ounces	11	12.5	13	.....

Brick-Making Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Keystone Clay Products Company, Greensburg, Pa. This is a six-kiln brick plant with a capacity of 60,000 bricks per day. The average daily output is 28,000 brick. Running hours per week, 60. (The pan and pug mills are operated approximately 48 hours per week.) Group drive.

Total connected horsepower, 215. Number of motors installed, 6. Average kilowatt-hours per month, 12,664.

Kilowatt-hours consumption for 12 months: January, 1,897; February, 1,593; March, 1,745; April, 2,156; May, 13,970; June, 1,782; July, 17,653; August, 19,689; September 24,731; October, 27,917; November, 13,970; December, 24,870.

Load-factor, 11.8 per cent; operating-time load-factor, 22.6 per cent.

The average total electric energy consumption per 1,000 brick is 26.4 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed withphase, 60-cycles, 220-volts. The motors are of the squ their respective drives. The supply source is two-irrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	40	840	Geared to a nine-foot dry pan and belted from extension shaft of dry pan to a 40-foot bucket conveyor.
1	40	840	Geared to a nine-foot dry pan and belted from extension shaft of dry pan to a 40-foot bucket conveyor and a 50-foot by 24-inch belt conveyor.
1	40	840	Geared to a No. 51 pug mill.
1	15	1,120	Belted through countershaft to a 140-inch blower. Speed 216 revolutions per minute. (Supplying draft for ovens.)
1	5	1,700	Belted to a 72-inch disk fan.
1	75	685	Geared to a No. 1 Giant brick auger (capacity 6,000 per hour). From the countershaft of brick auger is belted a 30-foot shaft (four hangers) which drives an 18-brick automatic cutter (three belt conveyors, 6-foot, 25-foot and 50-foot respectively), and a 10-foot bucket conveyor and repress.

All brick-making machines were supplied by the American Clay Machinery Company. Energy is supplied by the West Penn Electric Company.

Brick manufacturing plant having an average yearly output of 9,000,000 bricks. Plant operates 54 hours per week except during the months of December, January and February, when no work is done.

Total connected horsepower, 100. Total number of motors installed, 1. Average kilowatt-hours per month, 17,810.

Kilowatt-hour consumption for 9 months: May, 17,010; June, 15,600; July, 19,600; August, 18,600; September, 19,280; October, 18,280; November, 14,320; March, 17,520; April, 21,340.

Load-factor, 32 per cent.

The approximate electrical energy consumption per 1,000 bricks made is 21.3 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	100	580	Belted to a line shaft driving one nine-foot dry pan; one clay elevator; one E. M. Freeze Company size L, brick machine, capacity 3,000 bricks per hour; and one cutting table.

Manufacture of brick and tile products. Group drive. Running hours per week, 60.

Total connected horsepower, 60. Number of motors installed, 1. Average kilowatt-hours per month, 8,399. Average kilowatt-hours per month, per connected horsepower, 139.

Kilowatt-hours per month for 12 months: January, 7,870; February, 9,530; March, 13,070; April, 11,850; May, 12,050; June, 10,150; July, 6,010; August, 5,350; September, 4,000; October, 9,500; November, 9,720; December, 1,680.

Load-factor, 25.7 per cent; operating-time load-factor, 53.8 per cent.

The average electrical energy consumed per 1,000 bricks made is 11.2 kilowatt-hours.

MOTOR INSTALLATION

The motor installed in this plant is a 60-cycle, three-phase, 2,080-volt machine.

No.	Horse-power.	Speed R. P. M.	Application.
1	60	720	Belted to a line shaft driving one nine-foot, Frost Manufacturing Company's dry pan; one Chisholm & Boyd mixer; one six-mold brick machine, capacity, 30,000 bricks per 10 hours; and one 2,000-pound hoist elevator and conveyors.

Brick-Making Data—Sheet No. 2.

Pressed-brick manufacturing plant having an average yearly production of about 8,000,000 bricks. Plant operates 60 hours per week.

Total connected horsepower, 60. Total number of motors installed, 3. Average kilowatt-hours per month, 4,949.

Kilowatt-hour consumption for 12 months: January, 4,000; February, 1,940; March, 2,600; April, 5,000; May, 2,708; June, 5,346; July, 5,592; August, 5,680; September, 6,100; October, 4,350; November, 6,920; December, 2,905.

Load-factor, 15 per cent; operating-time load-factor, 31.8 per cent.

The approximate electrical energy consumption per unit of output is 0.00707 kilowatt-hour.

MOTOR INSTALLATION

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,200	Belted to an American No. 4 blower.
1	5	1,200	Belted to a line shaft driving one small planer; one small drill press; and one emery wheel.
1	50	850	Belted to line shafting driving one four-mould Boyd brick press, capacity 2,300 bricks per hour; and one eight-foot dry pan with elevator.

This plant has been motor driven for three years without a day's loss due to motor power. Energy is supplied by the Enid Electric & Gas Company.

Brick-making plant having an average output of 6,000 bricks per hour. Plant operates 45 hours per week, 8 to 9 months per year.

Total connected horsepower, 185. Total number of motors installed, 3. Average kilowatt-hours per month, 12,200.

Kilowatt-hour consumption for 7 months: May, 20,360; June, 14,310; July, 99,420; August, 11,910; September, 9,000; October, 4,300; November, 110.

Load-factor, 12 per cent.

MOTOR INSTALLATION

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M	Application.
1	100	850	Belted to a line shaft driving one E. M. Freeze Company Class 1 pug mill; one Freeze brick machine; one Freeze rotary cutter, size No. 20 one belt conveyor, 10-inch belt, 100 feet long, speed, 300 feet per minute; and one incline belt conveyor, 10-inch belt, 45 feet long, 8-foot lift, speed 300 feet per minute.
1	75	850	Belted to a line shaft driving two Thomas Carlin 9-foot dry pans, 150 revolutions per minute; two bucket elevators, buckets 6 by 9 by 6 inches on 28-inch centers; one bucket elevator, 25-foot lift, buckets 6 by 9 by 6 inches on 15-inch centers.
1	10	1,120	Back-geared motor, driving one 200-foot belt conveyor, 14 inches wide, 475 revolutions per minute.

Dry Pressed Brick Company, Sandpoint, Idaho. Manufactures pressed brick. Group drive. Running hours per week, 60.

Total connected horsepower, 117.5. Number of motors installed, 3. Average kilowatt-hours per month, 13,947. Average kilowatt-hours per month, per connected horsepower, 119.

Kilowatt-hours consumption for five months: April, 15,150; May, 18,280; June, 16,260; July, 15,780; August, 4,328.

Load-factor, 26 per cent; operating-time load-factor, 45.8 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60-cycles, 220-volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	75	720	Belted to a line shaft driving one Andrews brick press, No. AA-110, capacity, 1,800 bricks per hour; one Andrews brick press, No. AA-114, capacity, 1,840 bricks per hour; one clay mixer and feeder; one Scott pulverizer; one 6 by 10-inch bucket conveyor, speed 160 feet per minute, one 6 by 10-inch bucket elevator, speed 500 feet per minute; one nine-foot clay mixer; and one 12-inch double-drum hoist, speed 200 feet per minute.
1	35	900	Belted direct to one nine-foot exhaust fan. Speed of fan, 300 revolutions per minute.
1	7.5	1,800	Belted to countershaft driving one coal conveyor. Speed of conveyor, 200 feet per minute; capacity, 10 tons per hour.

Energy for this installation is supplied by the Northern Idaho & Montana Power Company.

Commercial Practice
Management, Rates, New Business

LOOK OUT FOR THE WIRES.

A Warning Against the New Haven High-Tension Lines.

The New York, New Haven & Hartford Railroad has sent out the accompanying publicity matter at the time of extending the electrification of its lines, as a warning to the public. The suitability of this for the purpose is apparent, and it may serve for a model in similar cases.

The New York, New Haven & Hartford Railroad has issued a warning notice addressed to all persons along the line covered by the recent work of electrification that its wires are about to be charged and that they therefore involve a deadly peril for mischief makers. This notice is addressed particularly to the small boy, whose venturesomeness and fondness for experimental research in connection with things that are dangerous is well known.

The wires are necessarily of high voltage in order that the power may be transmitted to the trains. One of the reasons why the overhead system has been used in place of the third rail is that the danger may be taken away from the immediate vicinity of the tracks. These wires are so placed that no possible harm can come to anyone unless he deliberately invites the hazard of a contact with the wire by some extraordinary act. It is possible for anyone deliberately to throw himself in front of a moving locomotive and so meet death; the result is the same when one goes out of his way to touch high-tension wires.

On April 1 that portion of the new electrified system from Glenbrook to Westport was energized, together with all feed and signal wires. This was for the purpose of testing out the system prior to the inauguration of electrical operation. From Westport to Bishop Avenue, at Bridgeport, the "juice" was turned on on May 10 or thereabouts, and from Bridgeport to Water Street, New Haven, about May 15. This marked the energizing of the entire electrification zone from New York to New Haven.

The New Haven's officials have already taken up the matter of the danger which it means for anyone who fools around these wires charged with 11,000 volts, and have been in communication with the mayors, fire-department officials and other authorities in all of the cities, towns and villages along the line from Stamford to New Haven. These authorities have promised their co-operation in trying to instil caution in the minds of the public, but it is the small boy with his love for deviltry that gives the railroad concern.

The latticed columns supporting the catenary bridges on which the wires are strung lend themselves to climbing. They could not be constructed in any other way. But the boy who climbs up one of these columns just for fun and tries to swing from a wire will never climb down again. It won't do for him, either, if his kite gets caught on any one of the wires that look so innocent, to try to poke it off with a pole. He would probably never fly that kite again, and a live boy is much better than a lost kite. Similarily, the boy who, just to see the explosion, sticks a wire down through the aperture of a bridge until it touches one of the trolley or feed wires, will probably pay for it dearly.

In the construction of the overhead system of electrification every possible measure has been taken to insure protection, but it is impossible to protect anything completely against the fool-hardy and against the boy who itches "to see just what would happen." There are many ways in which such persons can meet injury and even death if they venture too near the wires.

These high-tension wires necessarily have to run under the different highway bridges, and it might be possible, in some cases, for the boy or man bent on mischief to poke them with a stick or an umbrella. The boy who goes after a bird's nest in one of the latticed columns supporting the bridges is also flirting with death. Under no consideration should anyone except an employee climb up one of these columns.

At different points along the line there are what are called circuit-breakers, points where sections of the road can be de-energized. These are on the ground near the bridges and are surrounded by high board fences. They must not be entered except by authorized employees of the road.

It is hardly likely that the average citizen would have occasion to turn a hose in the direction of one of these high-tension wires. To do so would be most unwise. Water, while offering high resistance, will nevertheless conduct electricity. The officials of the road have recently been engaged in bringing this to the attention of the fire departments in the territory just electrified. No possible harm can come merely from the spray occasioned by squirting at a fire. It would be only a stream directed plump at one of the wires that would mean danger. In any case where the current might involve peril for the firemen the New Haven officials have urged that word be sent to the nearest telegraph office or that the despatcher's office be communicated directly with by telephone. In such an event the Cos Cob power house would be notified at once and inside of one minute from the time of notification the section involved would be "dead."

It is dangerous to cover outside high-voltage wires, and, as a matter of fact, there is no better known insulator than air. Under the plan followed in the construction of the New Haven system all contact and feed wires are placed so that in no conceivable way can anyone but a daredevil come in contact with them. As an additional protection, the road has just finished erecting six-foot board fences on the 30 or more highway bridges between Stamford and New Haven. Only by actually climbing over one of these fences could a person get within reach of any of the wires. At every conceivable place of danger the road has also erected signs reading "Live wire," "Danger," "Keep off." Over 2,000 of these signs have been installed. It is of course possible that cracks in bridges can be found, through which the small boy could poke something "just to see the fireworks." If he escaped with only a shock he would be exceedingly lucky.

One of the great benefits conferred on the community by electrification is the comparatively noiseless operation of trains. But this involves greater peril to trespassers, to boys and other persons who persist in crossing tracks and regarding a railroad right of way as a high road. The electric train gives little warning sound as compared with the steam train, and so it is best to keep entirely away from an electrified railroad. The increasing recognition given to the overhead system indicates that the day is coming when many railroads will be so operated and hence it would be well to cultivate the habit of caution now.

There is also anothre feature of the

electric trains presently to be operated which commuters would do well to heed. The electric train gathers speed four times as fast as the steam train. In 15 seconds it may be going at a rate of 30 miles an hour. Any one, therefore, who seeks to board an electric train after it has once started does so at the extreme peril of his life.

Prizes for Salesmen Stimulate Business in Louisville.

By means of a system of prizes for good work Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company, is getting increased results in the way of house-wiring contracts from five solicitors compared with the results eight men had been getting previously. A striking point in this connection is that the total amount offered as prizes comes to less in a month than the salary of one of the three men who was dispensed with. First of all is an efficiency prize, of $10, which is awarded monthly to the solicitor who is working on the house-wiring campaign and whose record at the end of the month shows the largest amount of business computed in terms of kilowatt-hours, who has put in the most hours overtime, whose reports are neatest, who is least often tardy and who makes the fewest mistakes in the contracts he signs. The record is kept day by day on a blackboard where all can see it and where each man can see how he and the others stand. In addition, $10 is given in prizes each week, divided with $6 for the man who gets the most business and $4 for the man who is second in the contest. Mr. Montgomery has found that this system does more to stimulate the solicitors and increase their efficiency than anything else he has ever tried. The contracts for the wiring of old houses are coming in regularly, some 49 having been obtained by the five solicitors last week.

Safety Campaign in Kansas City.

The Kansas City (Mo.) Railway & Light Company, controlling the local street railway and light companies, has launched a safety first campaign which is unusual in some respects. The company has begun the use of safety first signs on the front of its street cars, its method differing from those in vogue elsewhere, however, by reason of a frame which allows the sign to be changed as often as wished. An educational campaign among employees already has been concluded, and the light and street railway companies will give their attention to the general public for furthering the reduction of accidents.

Pittsfield Vacuum Cleaner Campaign.

The Pittsfield Electric Company recently conducted a vacuum cleaner campaign which resulted in considerable new business. The machines handled were the Hurley "Four" vacuum cleaner, and in event of the customer not wishing to pay cash for the machine they were sold on the basis of $10.00 with the cleaner and $1.00 a week thereafter until the machine is paid for. A week's free trial was given to anyone expressing a desire for same.

Following up the new sales policy, the Pittsfield Electric Company gave to any of its employees bringing in a prospect which afterwards resulted in a sale, a bonus of $5.00 as soon as the first $10.00 on the account was paid up. This offer was also open to contractors and their employees. These prospects were to be turned in to the new-business department in order to receive the $5.00 bonus. This plan was carried out by the company in a recent washing-machine campaign with marked success.

The main object of the campaign was to advertise electric service in the home, and this policy will be carried out in other branches during the year.

Wakefield Municipal Light Plant to Shut Down.

The Wakefield, Mass., Municipal Light Commission, composed of Edwin C. Miller, L. Wallace Sweetser and Frank J. Henkel, has just signed for the town a contract with The Edison Electric Illuminating Company, of Boston, whereby the latter will furnish all the electric service the town will use. This will include street lighting and all of the service for commercial light and power business.

Wakefield has been operating under the supervision of its Commission, the town's electric generating plant to furnish the service from dark until daylight and has taken such additional service as needed for daytime use from the Reading municipal plant. The Commission some time ago began investigating the possibilities of securing service from the big generating and distribution system of The Boston Edison Company and after a careful study of all the conditions has decided to shut down the town's own old plant, discontinue using the Reading municipal service and take the Boston Edison service. The change will be made as soon as The Boston Edison Company can extend its service lines to the town, which will be done in a comparatively short time.

Technically speaking, the Boston Edison Company will furnish a service described as 2300-4000 volt, 4-wire, 60 cycle, alternating current, from which either single-phase service for lighting or three-phase service for power purposes can be delivered as desired. This service will be run in duplicate for the extra protection of the town.

This change from the use of a municipal generating station of limited capacity to the efficient, economical service of a public service corporation with practically unlimited capacity, may mean much in the development of Wakefield's manufacturing business, and does not represent any increase of the town's financial obligations or any further investment in property and machinery.

Central-Station Power for Car Cleaning.

The Pullman Company has just made arrangements at Louisville, Ky., for the cleansing of its cars which call at that point with electrically operated vacuum cleaners. Heretofore the work has been done by hand in Louisville. The power will be supplied by the Louisville Gas & Electric Company, which is just completing the installation of service posts in all sections of the Louisville terminal yards. Each of these posts will have plug connections so that the power will be available wherever the car may happen to stand. The Pullman Company will use three of the vacuum cleaners and the current will be in use for eighteen hours a day. Each vacuum-cleaner motor will have a capacity of 1.5 horsepower. It is estimated that the new system, besides doing the work more thoroughly, will result in a big reduction of cleaning costs.

Popular Appeal Made for New Franchise.

R. P. Stevens, president of the Consolidated Electric Company, of Youngstown, O., as well as of other electric power and railway companies, delivered a vigorous address recently before the Northwest Improvement Club, of that city, relative to the present electric-light situation in Youngstown. The matter of a new contract with the company by the city is being discussed, and Mr. Stevens declared that the company is willing to make concessions in such a contract, in return for a five-year extension of the present agreement. Mr. Stevens took up complaints which have been heard, to the effect that other cities, particularly Akron, are receiving current for less than Youngstown, and showed that on the basis of population and light furnished, the latter town is receiving much the more advantageous rates. He declared that the company is now preparing to lay out a new system in Youngstown which will be adequate to give the best possible service obtainable.

Columbus Company Co-operates in Maintaining Good Lighting Installations.

The accompanying illustration shows the blank specification sheet used by the Columbus Railway, Power & Light Company in aiding commercial lighting customers in providing an efficient lighting installation. A careful record is kept by the new-business department of all commercial lighting prospects and of all changes from one location to another. A representative of the central station visits the customer moving to a new location, or a prospective customer, explaining that the company will be willing to co-operate in obtaining a satisfactory lighting installation without cost to the customer. With the consent of the customer the illuminating engineering department of the company draws up a suitable specification, conforming of course to the customer's general ideas, which are embodied on the specification blank, and this, together with a rough pencil sketch of the installation, is submitted by the customer to the various contractors and bids obtained.

This plan assures a well lighted store by giving the customer the benefits of the company's engineering knowledge and also permits of receiving bids from contractors on an engineering basis. The scheme which was inaugurated by W. A. Wolls, new-business manager, has proven very successful and has resulted in many notable installations in Columbus.

Form 476-2M—4-21-13

SPECIFICATIONS

For the necessary equipment to illuminate the

of

located at

The drawings furnished with these specifications, are to be considered a part thereof.

All wiring and fixtures to be acceptable to the Bureau of Inspection and a certificate furnished.

FURNISH:

Specification Blank Used by Columbus Company.

New Business Activities in Sandusky.

The Sandusky Gas & Electric Company, Sandusky, O., is conducting a vigorous campaign in order to secure the wiring of a greater number of houses in the city, using a large amount of newspaper space for that purpose. An advertisement headed, "Why This House Remains Vacant and Unsold," with the explanation that the reason is its lack of electric wiring, has done good work in this connection. The company is also offering an allowance of a dollar on old sad-irons taken in exchange for electric irons.

Free Current for Searchlight.

A feature of dedication week, to be held at Topeka, Kans., in the near future, will be a 20,000-candlepower searchlight to be installed in the dome of the State House. Arrangements for the work were concluded recently, Albert Patten, assistant general manager of the McKinley interests, agreeing to make the necessary changes. The top of the dome is 385 feet from the ground. About 1,000 feet of 50-ampere wire will connect the searchlight with the wires of the Topeka Edison Company.

Increasing Business Makes Extensions Necessary in Pittsburgh.

Contracts have just been let by the Duquesne Light Company, of Pittsburgh, Pa., for four turbo-generator sets, and the construction of new buildings and boilers for service at its Brunots Island power plant. These will give this one plant a total capacity of 100,000 horsepower.

The contracts for the turbines and generators call for an outlay of $400,000, while the new boiler plant will cost $200,000 additional. The Westinghouse Electric & Manufacturing Company was given the electrical order, and is working on it at present. This includes four 15,000-kilowatt turbo-generator sets, a total of 61,200 kilowatts. This, with 10,500 kilowatts in turbines now in the plant that are to be retained, makes a total of nearly 100,000 horsepower. The plant has also 30 boilers in its steam equipment and 20 additional boilers will be added at once.

In making these changes, the light company has abandoned three 5,000-kilowatt turbo-generator sets that have been doing duty for some time. The reason for abandoning the smaller machines is to increase the efficiency of the plant with larger units of power, at the same time reducing the space required.

From this great plant will radiate power lines that will operate the street lights in Pittsburgh and vicinity, as well as the thousands of motors for private users of power. Beside this, the street cars within the city will be operated from the same plant. On account of the vital part that the big plant is to play in the city life, special care is being exercised in placing it out of the reach of floods. The coal reserve that is to be carried will enable it to operate some weeks in case of interrupted coal delivery.

According to the contracts, the entire work will be completed during the current year. A large force of men is already at work on the foundations and steel work for the building and foundations for the machinery are also under way.

Electric Pleasure-Vehicle Exhibition.

Not in many years has there been so complete an exhibit of electric pleasure vehicles as that now being held under the auspices of the New York Electric Vehicle Association in the new showrooms of the New York Edison Company at Irving Place and 15th Street, New York City. Six of the leading builders of electric pleasure vehicles have brought together in this combined display the finest product of their factories. All of the cars may be seen to advantage in this large showroom; in fact, the exhibition of electrics marks the opening of this artistic display room.

Among the cars displayed are an Ohio brougham, a Rauch & Lang town car, a Detroit runabout, a Baker brougham, a Waverley roadster, a Rauch & Lang five-passenger brougham, a Waverley brougham and a Ward coupe chassis.

President Arthur Williams of the New York Electric Vehicle Association, regarding the exhibition, said:

"It has been our endeavor to make an electric vehicle display free from turmoil, dust, heat and other disquieting effects and to conduct an exhibit of quiet elegance, in a properly ventilated and tastefully decorated hall where one may examine the cars at leisure and without annoyance from either surrounding conditions or too attentive salesmen.

"The exhibit includes all that is new in electric car designs and really indicates that gratifying progress has been made in this direction within the past year. The cars are truly suggestive of dignity, safety, comfort and cleanliness."

Prosperity at Topeka.

The Topeka (Kans.) Edison Company has sent to the city of Topeka, a check for $1,190.33, representing 10 per cent of the company's net earnings during the past year, above the 10 per cent on the investment. The company's franchise provides for this payment. The check is the first turned over as the city's dividend, indicating that the company has had an exceptionally prosperous year.

Electric Sign Data

Wanted: Electric Signs.

Recognition of the electric sign's usefulness in other ways than for direct advertising is becoming general. This form of electrical publicity is, in fact, so widespread and productive that additional millions of dollars are spent for it each succeeding year.

What is not generally known, however, is the fact that owners of vacant lots and fine buildings are eager to have electric signs installed on them to increase their value. Operators in real estate appreciate the efficacy of an electric sign in endowing with life and light districts which would otherwise remain dormant or deserted.

Experience shows that a single sign on a building or a lot in an obscure corner of a city may start a healthy growth of business there. It becomes a landmark; it sheds light into the street; it makes travel safer at night; it enlivens the whole neighborhood and frequently induces other advertisers to seek the same location for their electric appeals.

That the owners of real estate have an understanding of the benefit that an electric sign will bestow on their property is demonstrated by their eagerness to have advertisers use space on buildings and lots without a cent of rental.

Frederick A. Kehl, president of the Brilliant Sign Company, St. Louis, recently told a representative of this magazine that his concern receives many offers of free space for the erection of electric signs in the different cities in which it operates.

"There is no prejudice against the electric sign as there was some years ago against the billboard," said Mr. Kehl. "On the contrary, the electric sign can find a place almost anywhere—on a hotel, an office building, a bank, or even a church. It is regarded not only as an appeal but as a token of life and activity.

"We are constantly importuned by owners of buildings and vacant ground to erect electric signs on their premises, and quite often they volunteer permission, expecting no compensation. In many such cases, naturally, the location is unsuitable because of its remoteness or for some other reason. Not infrequently, though, we take advantage of such offers when the placing of the sign will give our customers adequate 'circulation.'

"This favorable disposition of the public toward the electric sign is attributable, no doubt, to the fact that it represents a good deal of skill and attractiveness. Electric signs are not built in haphazard fashion. Their electrical mechanism is such that only experts in design and construction can successfully produce them. This insures the public against the sort of blotches and daubs that discredited the billboard.

"The brilliancy of electric signs, even when they blazon no pictures against the sky, is an advantage which the public as well as the advertiser may enjoy equally. When their effect is spectacular, electric signs give their surroundings a continuous expression of liveliness, activity, prosperity.

"All this explains why many people not interested either in the manufacture or use of electric signs are eager to have them on their property."

Electric sign erected by the Federal Sign System (Electric) in New York, at Forty-ninth Street and Broadway.

Sign operates as follows: Starting with a circle around the "P" each circle goes on very rapidly, whirling as it lights, giving the appearance of a hoop rolling from the left to the right of the sign. Everything goes out, and it instantly starts with the circle around the "A" repeating the operation backwards. Then each circle goes on one after the other, turning steadily until all are on, all off, all on together, and all off. Then as each circle comes on whirling the letter in th ecircle flashes on with it, each circle revolving rapidly to the left. The border wording then follows, one word at a time, until all are on, after which the border lights up and holds for a short time. The sign then goes dark and repeats. A Betts & Betts flasher is used.

The color effect is produced with Betts Color Caps.

The Louisville (Ky.) Commercial Club has under consideration a suggestion that it provide for the erection of a mammoth slogan sign, to be electrically illuminated and operated. The project, if undertaken, would call for a country-wide contest for the best slogan.

A restaurant in Denver has installed a novel electric sign over the entrance, consisting of the figure of a dainty maid in the act of placing before a patron a dish that closely resembles strawberry shortcake, accompanied by the words: "Like Mother Used to Make." Six colors and three different sizes of lamps are used.

Electrical Construction

CIRCUITS FOR ELEVATOR SIGNALING.

Complete Installation for an Office Building.

An office building generally requires an extensive elevator signal system as it is not only necessary to have some means of notifying the elevator operative of an approaching car of the presence of passengers at the various floors and of notifying these passengers of the approach of a car, but it is also necessary to provide some means for signaling the elevator operatives during those periods when continuous elevator service is not necessary.

This article describes the Armstrong system as installed by the Elevator Supply and Repair Company, of New York and Chicago, in the new Continental and Commercial National Bank building, Chicago, Ill. This system provides for both local and express service with floor and car-signal lights during the hours of continuous elevator service and for a car annunciator and bell for night and holiday service. For normal day service two signal lamps on each floor and one in each car are employed. These are so wired that the proper signal lamp on the floor where a signal has been given, lights when a car approaching that floor in the right direction is distant about the height of two floors. A little later the signal lamp in the approaching car is lighted. After a car passes the floor where the signal has been given both the floor and the car lamps are automatically turned off. If, however, the approaching car is crowded, the operative can switch the signal to the next car by means of the circuit breaker, thus leaving the next car to take on the passengers. For holiday and night service a bell and car annunciator are employed. When a signal button is pressed, the bell attracts the attention of the elevator operative on duty and by means of the car annunciator he learns the floor on which passengers are waiting.

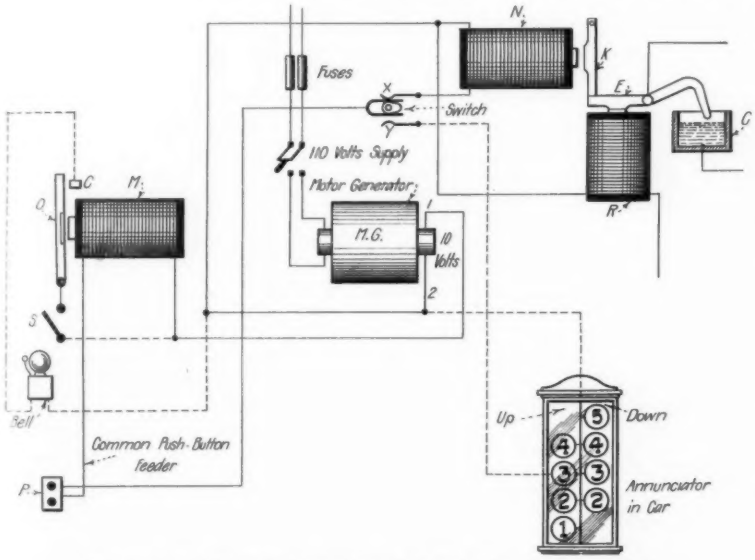


Fig. 1.—Third-Floor Push-Button, Bell and Annunciator Circuits.

The current for the push-button circuits, annunciator and bell circuits is obtained from a motor-generator *MG* situated in the pent house together with the other necessary signal apparatus. This motor-generator is supplied with 110 volts direct current and delivers 10 volts direct current. The current for the signal lamps on the various floors and cars is obtained from the 110-volt mains. For simplicity the wiring diagrams are confined to the circuits for a five-story building, express cars making no stop at the second floor. For the same reason the diagrams show only the circuits for one elevator and for only one of the push-button stations, namely the "up" push-button on the third floor.

Push-Button Circuits for Normal Day Service.

Figure 1 shows the push-button circuits for the upper push button of the third-floor push-button station, the full lines representing the circuits for normal day service and the broken lines, the additional wiring necessary to operate the annunciator and signal bell during those periods when continuous elevator service is not required. The switch *SW* is situated in the pent house and is used to effect the change from normal day signal service to night and holiday signal service.

When the switch *SW* is in the position shown, the circuits are arranged for normal day signal service. If the upper button of the third-floor push-button station *P* is pressed, an electric circuit is completed from terminal *1* of the motor-generator *MG* through solenoid *M*, push button *P*, switch *SW* and solenoid *N* to terminal *2 of* the motor-generator. Magnets *M* and *N* are thus energized causing them to attract their armatures *O* and *K* respectively. During normal day service the switch *S* is kept open and hence the attraction of armature *O* does not close the circuit represented by broken lines under these conditions. However, when armature *K* is attracted by its magnet, it releases the lever *E*, thus permitting its terminal to drop into mercury cup *C*.

Signal-Lamp Circuits.

Referring now to Fig. 2 it is seen that when the lever *E* dips into the mercury cup *C* and when the three-pole switch *A* is closed, the circuits for the third-floor signal lamp and the car lamp will each be completed except at one point. Tracing the third-floor "up" signal-lamp circuit, it is seen that the positive side of the 110-volt mains is connected through the lever *E* and the mercury cup *C* to the segment *3* of feed *V* of the "up" signal-lamp "slate." This "slate" consists of a number of metallic segments fastened to a piece of slate as shown. Now segment *3* of feed *W* of the "slate" is connected through lamp *U* on the third floor, the junction *T* and the switch S^1 in the car to the negative side of the 110-volt mains. This signal-lamp circuit can hence be closed by connecting the segments *3* of feeds *V* and *W* of the "slate."

Over this "slate" a short-circuiting brush travels and makes electrical connection between the segments of rows *W* and *V* of the "slate," hence closing the circuit of lamp *U* on the third floor when it reaches the segments numbered *3*. These travelling brushes are mounted on a brush holder mounted on a threaded shaft installed near and parallel to the "slate." The threaded shaft as described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 28, 1914, is driven by means of sprockets and a chain belt driven by the shaft carrying the overhead elevator-cable sheaves. The travelling brush holder hence has a movement proportional to the movement of the car, and by making the segments on the "slate" of proper size and locating them at proper places, the brushes will short-circuit them at the proper point in the movement of the car, thus closing the signal-lamp circuits on those floors where the pushing of a button has caused the corresponding mercury contact to be made.

The car lamps are automatically operated in a similar manner, the current flowing from the negative side of the 110-volt mains through the car switch S^1 and the car signal lamp *L* to the upper segment *Q* of the "slate," and then through a travelling set of brushes to segment *3* of row *V* from where it passes through the mercury cup *C* and the contact point *E* to the positive main. The brushes effecting this change are mounted on the same brush holder previously mentioned, one of the brushes commutating the segments of row *V* for the floor lamps and the other, which is slightly in advance of the former, commutating the segments in row *Q*.

After the passengers on the third floor are taken on the car the signal-lamp circuits are opened by the brushes ceasing to make contact with the proper segments on the slate. The mercury contact for this floor is broken by means of a reset "slate," the segments of which are mounted on the same piece of slate as shown in Fig. 2. The travelling brushes are electrically connected and mounted on the brush holder previously mentioned so as to move over the segments of rows *D* and *L* of the reset "slate." As the segments of the reset "slate" are so positioned in relation to those of the signal-lamp "slate" that the brushes do not connect the segments of row *L* with the segment *D* until after the car has passed the corresponding floor levels, the reset circuits are not completed until such a time. When the brushes connect the segments on the reset "slate" for the third floor, current flows from terminal *I* of the motor-generator *MG* through the car circuit-breaker S^1 to the upper segment *D* of the "slate," and from there through the brushes to segment *3* of row *L* of the "slate" from where it passes through the solenoid *R* to terminal *2* of the motor-generator. The energizing of the electromagnet *R* causes it to attract its armature *E* thus breaking its contact with the mercury in cup *C*. The signal circuits for the "up" position on the third floor are hence all returned to the normal open position.

Express and Local Service.

Only the circuits for express service which omits the second floor as a stop have thus far been considered. When local service is desired, the switch *B* is closed. Considering first the circuits shown in Fig. *2* it is seen that the closing of switch *B* connects the segments of *Q*, the car-lamp feed on the signal-lamp "slate," through the left blade of the switch *B*; and the first and second-floor lamp-feeder *F* to the third, fourth and fifth-floor lamp-feeder *G* through the right blade of switch *B*. The switch by connecting these circuits in parallel thereby permits the circuits of the car-signal lamps and the signal lamps on all floors to be closed by the means of the travelling brushes.

Fig. 3 shows that the closing of switch *B* connects the segments *D* of the reset "slate" together thus permitting the opening of the car and floor signal circuits below and above the third floor.

Complete Normal Day Signal Circuits.

Thus far only the circuits affected by the upper push button on the third floor have been considered, but the remainder of the equipment is laid out in a similar manner. With the exception of the first and last floors, a mercury-contact device with the necessary controlling mechanism is provided for each of the two signaling positions for each floor. Two "slates" each including both signal-lamp and reset segments are provided for each car, the one "slate" controlling the signal circuits during the upward movement of the corresponding car and the other "slate" controlling the signal circuits during the downward movement of the car. Only one set of travelling brushes, however, is used for each set of signal "slates." The "slates" are arranged so that the reversal of the screw driving the brush holder throws the brushes to the "slate" for the reversed direction of running. This shifting of the brushes is effected by the friction between the nut on the brush holder and the driving screw.

The pressing of a button on any floor causes the mercury contact to be made for that floor, thus energizing the signal-lamp segments on the corresponding "slate" for each car. When the first car moving in the right direction approaches the floor where the signal has been given, the travelling brushes for that car close the proper lamp circuits. If, however, the operative of this car does not desire to take on the passengers for any reason, he can open the floor signal-lamp circuit for his car and his car lamp by opening switch S^1, Fig. 1, which at the same time opens the left pole of the switch (Fig. 2), and causes the circuit of the reset solenoid for the floor where the signal has been given to remain open as the car passes the floor. The mercury contact for that floor is hence maintained and the proper signal-lamp circuits are closed as the next car approaches the floor. The switch S^1 is of the two-pole snap type, and the "on" button must be pressed before the circuits can again be completed.

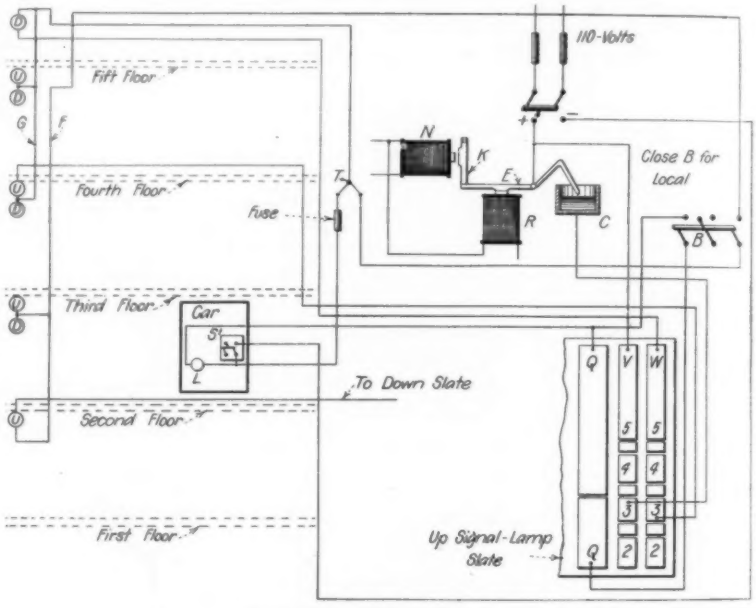


Fig. 2.—Signal-Lamp Circuits.

As each car must necessarily stop at the first and last floors on each round trip during the day, no push-button signaling is required, as all that is needed is the closing of the floor signal-lamp circuits upon the approach of a car. Fig. 2 shows the lamp circuit for the fifth or last floor. One terminal of the lamp is connected to segment *5* of feed *W* of the "slate." When the travelling brushes connect the segment *5* of feeds *W* and *V*, current will flow from the negative side of the 110-mains through the "slate," lamp *D* on the fifth floor and switches S^4 and *A* to the positive side of the mains, thus completing the lamp circuit. A similar system is employed for the first floor.

Holiday and Night Signal Service.

Fig. 1 shows the additional wiring required for holiday and night signal service in broken lines. In order to put this system into service switch *S* is closed and switch *S W* thrown in the reversed direction, the latter thus breaking contact with *X* and making contact with *Y*. The pushing of the upper push-button on the third floor will hence cause current to flow from terminal *1* of the motor-generator *M G* through the solenoid *M*, the push-button switch *P*, the switch *S W* and the third-floor "up" indicator on the car annunciator to terminal *2* of the motor-generator. The proper indication is hence given on the car annunciator and the operative's attention is called to his annunciator by the ringing of the signal bell, the circuit of which is closed through the contact *C* upon the attraction of the armature *O* due to the flow of current through solenoid *M*. As the signal bell is located so that it can easily be heard on all floors only one bell is required. The push-button circuits for each floor are connected to the car annunciator in the manner shown by the broken lines in the diagram.

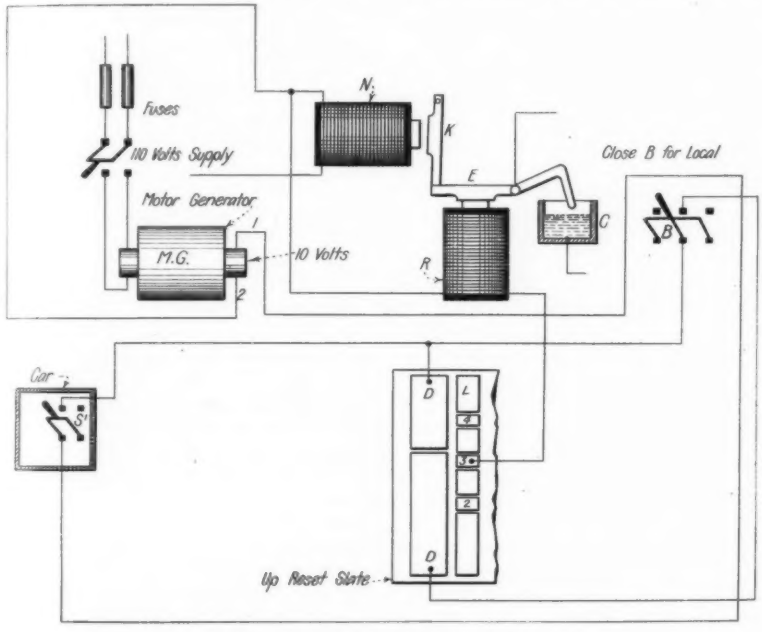


Fig. 3.—Reset Circuits for Third Floor.

New York Approval of New Devices.

The Advisory Board of Engineers, which supervises the electrical inspection service of the Department of Water Supply, Gas and Electricity, New York City, desires to have before it, at the time of consideration of any new device or installation, as full information as it is possible to obtain, otherwise the decision of the Board has to be postponed until further information or explanation is forthcoming.

The following announcement is intended to facilitate the transaction of business.

To Manufacturers of Electrical Devices.

(1) For what purpose is the device or appliance designed?

(2) Must be plainly marked with the name or trade mark of the maker and the current and voltage for which the device is designed.

(3) Is approval of the device desired for its use in New York City only?

(4) If a new device is submitted, a complete description in writing, and a sketch or print showing its use, if necessary, should accompany the application for approval.

(5) The manufacturer's name and address should appear clearly in the application and on the device.

(6) If approval on insulated or other wire is desired, samples must be submitted at the time of application.

(7) Give all information which will be helpful to the Board in judging as to the compliance of the device with the requirements of the Electrical Code of The City of New York.

To Electrical Contractors and Engineers.

(1) Is approval desired on the installation for use in New York City only?

(2) Submit a complete sketch or print showing wiring and other details of installation, and, if practicable, a print showing a plan and cross-section of the particular portion of the installation under consideration for approval.

(3) Explain in full detail why this installation is submitted for special approval.

(4) Contractor's or engineer's name and address should appear clearly on all papers submitted.

Gary Passes Electrical Ordinance.

Gary, Ind., has recently passed an ordinance requiring the licensing of persons engaging in electric contracting business. Journeymen, working for a licensed contractor, are not required to take out licenses. Under the new ordinance any person applying for such a license must furnish satisfactory evidence that he is competent to engage in such business and must furnish a bond of $500 to the city of Gary as a security for the proper performance of the applicant's duties. Licenses are issued for one year, the fee for the first year being $25 and for succeeding years, $10.

This electrical ordinance also provides for the inspection of all electric wiring with the exception of minor repairs by the Indiana Inspection Bureau, acting as agent for the city of Gary. The inspection bureau will collect fees for the inspection of electrical work based on the number of circuits, fixtures, generators, motors, and switchboards installed. For small work the minimum fee will be twenty-five cents.

For outside work the National Electric Light Association's specifications for outside work are adopted. Semi-annual inspection of all outside electrical work on which the voltage is over 110 volts is also authorized, with the provision that all defects reported shall be remedied within 24 hours after notice has been given to the owner of the installation. A fine of from $10 to $100 will be imposed on any person or firm violating the provisions of the ordinance for the first or second time, and the license will be revoked and forfeited for a third offense.

LETTER TO THE EDITOR.

Percentage System in Electrical Contracting.

To the Editor:

Commenting on the very excellent discussion of "The Percentage System in Electrical Contracting," contained in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 9, I would like to say that R. G. Littler's comments seem to cover the vital points of the subject very thoroughly. The main point when doing work under the percentage system has always been to determine the cost price of material to which the buyer is entitled. If the contractor is buying sockets by the thousand in order to obtain a good price on them and is doing, for example, a $300 job for a customer, in which he uses 150 sockets, I hold that the customer is only entitled to the 150-lot price and that all other material should be charged for in the same manner. Otherwise the contractor is donating the difference in price to the customer and if he does the same thing with every percentage contract, he is giving away annually a very large percentage of his legitimate profit.

Nine-tenths of the buyers want a fixed sum agreed upon as the maximum cost of work done under the percentage system, thus making practically a straight contract with provisions favoring the buyer. Moreover, much time is required to explain to most buyers the meanings of the terms "actual cost of material," "overhead expense," etc., so that when all is considered, we prefer a well defined agreement with accurate specifications and a straight contract price. Life is too short to spend valuable time explaining the variations of bids under the percentage system. Most of these are due to variations in the overhead expense, a factor which is bound to vary with different concerns.

I shall take this opportunity to say a few words about small jobs. Most contractors aim to secure large work. In the case of the average contract of from one to two thousand dollars, one will find from three to 10 bidders; but there are many small contracts which these contractors overlook or do not care to take. The way large contracts are let usually allows the contractor only about 10 to 15 per cent profit. There are many small jobs where one can obtain a profit of from 20 to 30 per cent and obtain prompt payments. Even if one loses on several of these contracts, he is still ahead of the game, for he can carry on twice the amount of work within a definite period of time with the same investment, a smaller stock and equipment, less detail and supervision, and fewer costly mistakes, than if he had engaged in only large work. It might, therefore, pay to develop this end of the contracting business for if there is enough business, it is by far the most profitable. If any large concern will take the time to investigate the source of its profits, it will find that its profits are made on the medium and small sized jobs and not on the contracts obtained in competition with numerous other bidders.

This is true of every business. One does not see the public asking for bids on small articles of every-day use, because the amount is too small to spend time bargaining over. One goes to the most convenient place and buys the article. The same is true in our business. When a man desires one or two additional lights he does not ask for competitive bids but telephones a contractor. If one's price is reasonable he obtains the work. The transaction is closed and one is ready for another job.

I wonder if any of us ever try to figure the labor required to keep track of the many details of a large contract, which is prolonged for so long that we wish we could break the contract, pay or no pay, in order to eliminate the time and labor required to properly take care of these details. I think that no amount figured for overhead expense will cover the worries incident to the eternal watching of the condition of the work so that one can have his men on the job at the proper time. For large work one must have men and expensive equipment waiting in one's shop. These must be ready the moment the call comes. Anyone who has handled much new building and store work will know just what this means.

In closing I wish to remind my fellow contractors not to overlook or slight the small job. If one must figure on other work, he ought to demand his price or let the work alone. When price cutting starts, no good can come from it. It usually ends by the sheriff putting the padlock on the door of the price cutter.

E. M. Raetz.

Rochester, Minn., May 11, 1914.

Indiana Contractors to Meet.

The annual convention of the Electrical Contractors' Association of Indiana will be held in Indianapolis on May 28 and 29.

The session on Thursday morning will be a closed one, at which the business of the association and the reports of committees will be taken up,

In the afternoon, an open session will be held. J. E. Latta, of the Underwriters' Laboratories, will give a talk on "The Underwriters' Attitude." C. C. Perry and H. H. Harrison, of Indianapolis, will speak on "Co-operation with the Central Station." There will also be talks on the position of the jobbers and the development of the electric lamp. In the evening there will be a Jovian rejuvenation.

At the closed session on Friday morning, there will be talks by Ernest Freeman, president of the National Association, and by George W. Hill, special representative of the National Association. The election of officers will also take place and reports of the Legislative Committee and the Underwriters' Committee will probably be presented.

The session on Friday afternoon will be an open one. T. A. Wynne, statesman for Indiana of the Jovian Order, will speak on "Jovianism." H. H. Magdsick, of the National Lamp Works, will speak on "The High-Efficiency Lamp." G. M. Sanborn, of Indianapolis, will present a paper, "Pitfalls in Estimating." It is expected to have an additional paper from the Society of Electrical Development on "Co-operation."

Other papers are expected during the convention from G. E. Varney and R. P. Oblinger, representing the jobbers, and by C. O. Brondel, of Warren, O., on "Application of Lighting Units."

On Friday evening the Indianapolis Electric Club will provide entertainment for members and guests at a boxing bout.

The president of the Indiana Association is M. K. Foxworthy, and the secretary is George Skillman, of Indianapolis. A souvenir program for the convention has been prepared which contains letters from T. B. Hatfield, H. Comer Wolf, A. L. Swanson, G. M. Sanborn, Brice H. Reid, and M. K. Foxworthy. It also contains the constitution of the association and gives reasons why all contractors in the state should become members.

New Electrical Rules for Springfield.

A new electrical code is being prepared by the city commissioners of Springfield, Ill., which has in view greater safety. One requirement of the new ordinances will prohibit the attaching of wires to buildings except with a clearance of seven feet. F. H. Spears is city electrician.

Atlanta Contractors Organize.

A number of the leading electrical contractors of Atlanta, Ga., met on May 6 and formed an organization to be known as the Atlanta Electrical Contractors' Association. The following were unanimously elected officers for one year: Fred H. Miles, of the Gate City Electric Company, president; Horace C. Russell, of Greene & Russell Electric Company, secretary; William F. McLendon, of the Cotton States Electric Company, treasurer.

Co-operation in Purchasing Stationery.

The Educational Committee of the Illinois Electrical Contractors' Association, of which F. L. Decker is chairman, has purchased a large quantity of sales, order, charge and credit tickets for the use of its members and the members of the Faraday Electrical Association, of Chicago. By purchasing this material through the Committee, members not only get a better price than is made on retail orders, but get the benefit of the experience and study of the committee in selecting the best form of tickets. Contractors desiring to avail themselves of this opportunity should address F. L. Decker, 2806 Sheffield Avenue, Chicago, Ill.

Gary Contractors' Association Formed.

An electrical contractors' association was recently formed in Gary, Ind., the following firms being represented: J. J. Scanlon Electric Company, Central Electric Company, Horton & Williams Electric Company, Star Electric Company and A. B. Harris Electric Company. The object of this association will be to promote good will and co-operation among electrical contractors. The officers of this association are: A. B. Harris, president; Mr. Jennings, vice-president; J. J. Scanlon, treasurer, and George Horton, secretary.

Storage-Battery Sludge.

Those who have in charge the care of storage batteries are aware of the use and purpose of a wooden stick to move the sediment from around the bottom of the plates so as to prevent it from accumulating in such quantities as to allow it to get up to the bottom of the plates. An improvement over the straight stick commonly used, is to make one which has an L-shaped piece left on the end. This should be made from one whole piece, as no metal should ever be inserted in the electrolyte. The advantage of the L-shaped piece is that it projects under the plates, allowing the sediment to be more completely and readily spread.

William A. Murray.

Among the Contractors.

Nollenberger & Dorner, electrical contractors of Denver, who have recently moved into new quarters at 1408 Stout Street, have added a line of fixtures displayed in an attractively arranged special fixture-display room.

The electric wiring contract on the new Swinney School in Kansas City, Mo., was let to the Burkholder Electrical Company, whose bid was the lowest of those submitted. The contract price was $3,950.

William A. J. Guscott has recently established a contracting business at 628 Eighteenth Street, Denver, Colo. Mr. Guscott has had a number of years' practical experience, during which time he has superintended some of the largest wiring installations in Denver, and he enjoys a wide acquaintance in that city.

The Wilson-Maltman Electric Company, Baltimore, Md., has recently been awarded the contract for the electric work in the tunnels connected with the power house of Johns Hopkins University, Baltimore. This company has been awarded all of the electric work which has so far been let in connection with the new buildings of the University. The work includes the wiring and fixtures for the administration building; wiring and fixtures for the electrical and mechanical buildings; wiring and fixtures for the power house and all of the electric work in connection with the tunnels. The same company has recently been awarded the electrical contract for the new hospital for the Women of Maryland and for the power house and tunnel work for the Eastern Shore State Hospital, Cambridge, Md., where the firm also is wiring the main building.

The employing electrical contractors of Dayton, O., have decided to reject the demands recently made upon them by the electrical-workers' union of the city, including recognition of the union. As a result the men are now on strike. It is understood, however, that a number of the men who quit work are not members of the union, and are not receiving strike benefits, in consequence of which, it is stated by several of the contractors, they are willing to come back to work. The union men are insisting on their point, however, and the strike bids fair to be prolonged. Several other trades in the city, notably the painters, are also on strike, practically tieing up building.

Members of the Youngstown (O.) Local No. 64 of the International Brotherhood of Electrical Workers were the hosts on May 11 of the contractors and employers in the electrical trade in that city. It was a get-togther meeting, having for its principal object the cultivation of closer and more friendly relations between the employers and their men. The affair was held at the Ohio Hotel, and a banquet was the principal feature, informal addresses and an entertainment program also being given.

Members of the Louisville Electrical Clearing House, having adopted stringent regulations in the way of the loop system for wiring, etc., are now considering means for increasing efficiency in the wiring business. The problem was gone over at length at the last two meetings, Frank A. Good, electrical engineer with F. A. Clegg & Company, delivering the principal address. The last meeting also was the occasion for a demonstration of insulation for fixtures. Membership and interest in the work of the organization are increasing, and the Kentucky Actuarial Bureau, in whose offices the meetings are held, has arranged to furnish larger quarters.

The Ogden Electric Supply Company, of Ogden, Utah, is just completing the complete electrical installation in the new Essles office building. This is the largest office building in Ogden.

The Independent Electric Company is the name of a new electrical-contracting and supply business, recently established at 119½ West Second South Street, Salt Lake City, Utah. H. M. Mylar, E. R. Haacke and J. E. Hennefer comprise the firm.

The Brigger-Hetherington Company, of Boise, Idaho, is just finishing the contract for the installation of wiring and fixtures in the new Elks Building in Boise.

The Idaho Electric Supply Company, of Boise, Idaho, has received the contract for the rewiring of the Y. M. C. A. building at Payette, Idaho.

The Westlake Construction Company, of St. Louis, Mo., has secured the general contract for the construction of the $1,000,000 Muehlebach Hotel at Twelfth Street and Baltimore Avenue, in Kansas City, Mo. Much electrical work of all kinds, including the construction of a power plant, is to be done.

Robert B. Kyle, electrical contractor of Pueblo, Colo., has recently moved his place of business from 124 South Union Street to 226 North Union Street, where he has a well located store which includes a large, attractively arranged and well stocked fixture room. This is the only fixture room in Pueblo.

Charles W. Perry has recently taken over the business of the electrical department of Higley & Dudley Company, at 109 East First South Street, Salt Lake City, Utah.

Palmer & Wall Electric Company has recently been organized and will conduct a general electrical repair business, specializing in armature winding, at 112 Michigan Street, Toledo, O.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, Vice-President, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Engle, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.

MEMBERS AT LARGE:
George L. Collison, James B. McCarthy
Frank R. Daniel, Thomas D. McColl
James H. Fenton, C. W. Mitchell
F. G. Hartwell, A. A. Moffitt
J. E. Latta, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary is happy to announce that the New York Section has gained twelve members this month; the Western New England Section, three and the Eastern Massachusetts Section, two. The California Association of Electrical Inspectors has organized as the California Section with C. W. Mitchell, of San Francisco, as president.

The Secretary desires to call particularly to the attention of Executive Committee members the following resolution which was adopted unanimously at the last meeting of the Western New England Section:

"Resolved,—That the Secretary be and hereby is directed to request the National Secretary to direct his best efforts toward securing explanatory answers to the questions which are to appear in the question box of the National Association, these answers to consist of more than the words 'Yes' or 'No'".

One of the valuable things about these answers should be that they give an idea of the reasoning upon which a writer bases his answer. Even answers to questions that seem almost transparently clear can be improved by a little additional matter. There is almost always something that is obscure in the questioner's mind and a brief explanation of the answerer's idea of why the Code takes the position it does, is very valuable, as 15 or 16 of these will be fairly certain to put things in a clear light when collated.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Section Report.

The regular monthly meeting of the Eastern Massachusetts Section was held on Thursday, May 14, at the office of the commissioner of wires of the City of Boston. In the absence of President Davis, of Brookline, Mass., Commissioner of Wires Fuller, of Somerville, Mass., was elected chairman of the meeting. The Executive Committee, which had met earlier in the day, reported that they had settled upon a visit to New Bedford, Mass., for the next meeting, which is to be held during the week of June 22, the exact day to be settled later. The entertainment will include a clam bake, and visits to various places of electrical interest in the city, under the guidance of William R. Briggs, inspector of wires, of New Bedford, Mass.

After the reading of the records of the last meeting and the disposal of local and routine business, the Secretary presented a brief historical paper giving an account of the development of the carrying-capacity tables of rule 18 of the Code. In presenting the paper he disclaimed any attempt at originality and stated that what he had written was intended merely as a brief summary of the work upon which the table of rule 18 is based. At the conclusion of the paper there was considerable discussion by the members present, of the points brought out, after which the meeting adjourned subject to the call of the next meeting.

William Lincoln Smith,
Section Secretary.

The Secretary regrets very much the delay in getting out his report, which he promised the members they should receive several weeks ago. He can only plead that the pressure of business has prevented its completion at an earlier date and he trusts that the members will forgive him, as he is really trying to keep the work of the office up to date as well as he can.

At the annual meeting of the National Fire Protection Association, which was held in Chicago, May 5, 6 and 7, our Association was represented by delegates, namely Executive Committee members Frank R. Daniel, J. E. Latta, and Thomas D. MacColl. At the time of writing this message the Secretary has not received any word in report of the meeting, and could hardly expect to receive a report at such an early date.

In conclusion he desires to call attention to a void in his system which can only be filled by the delicate attentions of the members in supplying him with an assortment of questions. Please attend to this, it will be of great assistance.

NOTES ON THE TABLE OF CARRYING CAPACITIES OF COPPER WIRE.[1]

By W. Lincoln Smith.

I have been led into preparing these brief notes upon the subject matter of Rule 18 of the National Electrical Code largely on account of the numerous questions put to me by wiremen and others as to the source and meaning of the current values given in Table A of that rule. Further, many of the men now engaged in or entering upon inspection work are not ac-

[1] A paper read before the Eastern Massachusetts Section on May 14.

The responsibility for all statements in articles and papers in these columns rests with the authors thereof, and not with the association, unless the said paper or article is certified by the secretary as having been presented to the executive committee and its publication as association matter duly authorized by them.

quainted with either the research work nor the laborious conference work attendant upon the reduction of the results of the said research to a form suitable for the purposes of the Code.

It is always well that an inspector should understand enough concerning the principles of an arbitrary set of specifications of this kind to answer questions which may be asked regarding its requirements, for while it may be in theory no part of his business to take his time for giving wiring instructions; at the same time if he can in a few words explain to a workman, interested enough and intelligent enough to ask the question, why Table A says 125 amperes for a rubber-covered wire of No. O B & S gauge rather than some other nearly similar value, he accomplishes two things. First, he makes the questioner understand that the rule is not the mere arbitrary say-so of some "highbrow" of whom he never heard, and secondly, he gives a distinct impression that he himself is not merely enforcing a printed rule handed him without knowing why, but that he has that underlying knowledge of principles and causes which will invariably lead to respect for his decisions when circumstances lead him to require some thing to be done which the Code does not clearly demand upon the face of things. Men are usually ready to do the right thing without controversy when they understand why it is the right thing, and better results in workmanship, harmony, etc., will certainly follow than when the direction is simply enforced by the apparently arbitrary invocation of the legal authority invested in the inspector.

Now without asking pardon for this somewhat lengthy introduction let us consider briefly the origin of the rule in question.

In the very earliest days when attempts were first made to transmit electrical energy over conductors in any quantity, it was found that two things must be considered, neither of which were of any importance when only feeble battery currents for moderately long telegraph lines were being considered: (1) the I^2R, or heating effect of the current; (2) the insulation for the relatively high voltages used; while from these two immediately arose the third question, what will be the effect of the former upon the material utilized for accomplishing the latter?

The very earliest investigation upon the carrying capacity of conductors was made by Prof. George Forbes, and published in the *Proceedings of the Society of Telegraph Engineers and Electricians* for March, 1884. The experimental portion of the work was unfortunately meager, while some of the thermal data used do not well apply to the conditions of the problem, and hence, although the mathematical discussion of the principles involved and their application to the concrete case was most thorough and excellent, the paper is not of material value to us.

Following Forbes, Sir William H. Preece, of the British Post Office, made an investigation which is also of great importance and which was presented to the Royal Society in March, 1888, it also being printed in the *Proceedings* of the same society as was that of Forbes. It, however, deals almost exclusively with the currents necessary to fuse wires of different metals and sizes and hence it too has but slight bearing upon our subject.

The next work which we find is the great classical paper on the subject presented to the Edison convention at Niagara Falls in August, 1889, by Prof. A. E. Kennelly, giving an account of the investigations made by him at the Edison Laboratory in Orange, N. J.

In the spring of 1891, Messrs. Sykes and Brainard took as their graduation thesis for a degree at the Massachusetts Institute of Technology, the problem of repeating some of Professor Kennelly's work and attempting to check his results with other types of insulation. They were, however, unable for lack of time to carry their work sufficiently far to do more than produce results showing a fair degree of concordance.

Finally, in 1895, H. N. Rust undertook as his graduation thesis an investigation of the currents at which wires of varying sizes and types of insulation would heat enough, (1) to reach the temperature of boiling water, and (2) the softening and ultimately the smoking point of the insulations.

Let us turn now to a brief examination of the work done by Professor Kennelly.

He studied (1) The action of insulated copper wire laid in wooden molding; (2) Of copper wire both insulated and bare hung on poles in the open air; (3) Of copper wires and strips suspended across a room to represent conductors in a station, and also to form a connecting link between the first and second sets of tests.

We shall be interested only, at present at least, in the first set of tests—those performed with wire laid in molding, or, as it was at that time called, panelling.

His molding was made in two sizes and in each case was laid on the laboratory floor as a support. Twenty-four wires were tested, varying in diameter from 18.5 to 445 mils.

The smaller sizes were tested one at a time, the larger sizes in two lengths at a time, each length occupying one of the two grooves in the molding.

His current was taken from a 110-volt direct-current Edison generator, its amount being controlled by a variable resistance consisting in part of a lamp bank and in part of a variable rheostat.

The value of the current was determined by means of a standard low resistance connected to a potentiometer, the settings of which were constantly checked against a Latimer-Clark standard cell. There was also included in the main circuit a standard ammeter as a secondary check. Each test was run for ten minutes and the current determined at minute intervals, the mean value being used in the calculation of the test.

The temperature of the wire was determined by the resistance method, using a differential galvanometer. Included in the main circuit was a standard invariable platinoid resistance; this gave a constant potential drop acting in one coil of the differential galvanometer; the other coil, being connected to the terminals of the wire under test, was subject to a variable potential drop increasing with the temperature of the wire, and with the proper adjusting resistances in the circuit these two potential drops were balanced against each other, by bringing the galvanometer to zero. Within the range of temperatures used, the temperature-coefficient of copper was taken as 0.00388 t, where t is the elevation of temperature in centigrade degrees. From the settings of the instruments in the circuit of the differential galvanometer it was, of course, easy to determine the amount by which the test wire increased in resistance, and therefrom by means of the above coefficient the corresponding temperature rise in centigrade degrees.

In each case the length of wire tested was 20 feet, approximately.

Theoretically the heating should increase as the square of the current; nevertheless a direct plot between currents squared and the temperature rise would give little information because the conductivity of the molding for heat varies, and the fit of the wire in the molding grooves has an important and varying effect. Under these conditions the heating would naturally increase faster than in proportion to the square of the current; however, as the temperature rises the convection and radiation from the surface of the molding also increase, the two effects tending to counteract each other, there being, however, too many variables for us to have reason to anticipate much, if any, agreement between the curve of squares and our measured relations. Professor Kennelly remarks that for diameters less than 100 mils the temperature seems to rise more slowly than as the square of the current, for diameters over 300 mils rather more rapidly, and between these two limits nearly according to the simple law.

He next determined by this method the curves of relationship between wire size and current for various temperature increments, of which I give three, namely the curves for 10, 40 and 80 degrees rise.

The accompanying table gives the data from which these are plotted, as well as several other curves which will be alluded to later on.

TABLE I.

Diameter in mils.	10 degrees rise.	40 degrees rise.	80 degrees rise.	10 degrees. Bare copper.	Boiling point.	Smoke point.
40	7	17	24	9	30	35
80	15	33	49	18	65	75
120	26	52	77	29	105	115
160	37	74	109	41	150	162
200	52	100	144	52	195	215
240	68	129	183	64	245	270
280	87	164	227	78	295	330
320	108	204	274	92	350	395
360	134	244	324	106	410	460
400	162	288	...	122	485	530

In this table, the first column gives the wire diameter in mils, the second, third and fourth, the currents in amperes required to give a temperature rise of 10, 40 and 80 centigrade degrees to wire run in moldings; the fifth column, the amperes necessary to give a temperature rise of 10 centigrade degrees to bare bright copper wire hung horizontally in still air at a temperature of 20 degrees centigrade, or 68 degrees Fahrenheit. The last two columns give the current necessary to raise the temperature of the insulated wire to such a point that when a small chip is cut out of the insulation and a drop of water placed on it, the water will just be brought to the boiling point, and the temperature at which the first traces of smoke can be detected emanating from the insulation. These last two columns are taken from the thesis of Mr. Rust already referred to. Briefly, the method used in determining these was as follows: The current was taken from the secondary of a large welding transformer, and carefully measured by means of alternating-current ammeters checked against each other and calibrated by direct currents, using reversals. The wires were cut into lengths about three feet long, the insulation stripped back about one inch from each end, and the wires clamped firmly in the jaws of the transformer. The wires were screened from heat and drafts and the surrounding temperature kept as constant as possible.

The wires tested ranged in size from No. 14 to 0000 B & S gauge and in all 75 samples were tested, of 12 different types of wire, as follows:

Americanite, next core thick black rubber, single braid glaze. Anchor, black rubber compound, single braid. New York Insulated, white rubber, then black rubber compound, then braid. Okonite, black rubber compound, single braid. Simplex, extra thick black rubber compound, double braid. ..... white rubber compound with single black braid. Underwriter's Wire, cotton braids with white fire-resistant compound. Weatherproof line wire, one black weatherproofed braid. Weatherproof line wire, two black weatherproof braids. Phillips wire, three black weatherproof braids. Clark line wire, one black weatherproof braid. Salamander wire, soft unvulcanized white rubber, then layer of black vulcanized rubber, then a greyish crumbly fire-resistive compound, then double weatherproof braid.

Professor Kennelly had stated in his papers that his tests showed conclusively that the effect of the insulating compound was to cool the wire. He found that a wire with a thick covering of insulation ran cooler than one of corresponding size with a thinner covering and observed that a bare copper wire laid in molding rose fully 30 per cent higher in temperature than a covered wire of equal diameter and load under the same conditions.

The same effect was observed in the wires tested by Mr. Rust, the effect being very obvious.

The table of boiling-temperature, current and smoking-temperature currents are the mean values obtained by consolidating all the different samples and makes of like sizes.

The striking thing in the original records is the surprising way in which the currents necessary to produce the smoke indication bunch about the mean value given in the table, wires of widely different types agreeing with pronounced closeness. The only one showing marked variation in this regard was the Salamander, which regularly ran pronouncedly higher, so much so that it required a plot of its own and could not justly be used in getting the mean values of the others.

It is obvious that from Professor Kennelly's data and plots we can determine the current necessary to bring a wire to any desired temperature, provided we know the temperature of the wire and its surroundings when not carrying a current.

We must, therefore, settle on an allowable limiting temperature and an assumed starting temperature. A committee of the English Institution of Electrical Engineers reported a rule in 1888 which was as follows: "The conductivity and sectional area of a wire should be so proportioned to the work it has to do that if double the proposed current be sent through it the temperature of the conductor shall not exceed 150 degrees Fahrenheit." As was stated, if this or any similar rule is to be applied we must assume a starting point and this Professor Kennelly took at 75 degrees Fahrenheit. Now 150 degrees Fahrenheit=65.6 degrees centigrade and 75 degrees Fahrenheit=23.9 degrees centigrade; the difference is 41.7 degrees centigrade, so that our conditions are:

(1) Double the allowable current shall not cause a final temperature higher than 65.6 degrees centigrade.

(2) Double the allowable current shall not cause a greater rise in temperature than 41.7 degrees centigrade.

Remembering that the temperature rise is approximately proportional to the square of the current, this criterion will work out that the allowable current must not produce a rise in temperature of more than 10.4 degrees centigrade or 19 degrees Fahrenheit and to allow for the fact previously referred to, that actually the temperature increases rather more rapidly, we use 10 degrees centigrade or 18 degrees Fahrenheit.

Professor Kennelly then proceeds to find a formula which shall best represent his 10-degree-rise curve by the usual methods and finds

$$d=14.7\sqrt[3]{I^2} \quad \text{or} \quad I=0.07775\sqrt{d^3}$$

where d is the diameter of the wire in mils and I the current in amperes.

This equation gives a curve which fairly represents the plot of the observations for 10 degrees centigrade rise, but which gives values slightly less below the 300-mil wire and then departs from it quite rapidly, as shown in Table II.

TABLE II.

Diameter in mils.	10-degree curve.	Equation to nearest integral number.	Current based on 1,000 amperes per square inch.
40	7	5	1.8
80	15	14	5
120	26	23	11
160	37	35	20
200	50	50	31
240	68	66	45
280	87	84	62
320	108	103	81
360	134	122	102
400	162	143	126

The last column of this table gives the allowable currents based on the standard of 1,000 amperes per square inch of cross-section.

We are now ready to consider the situation as it presented itself in the spring of 1896, when the first meeting of the National Conference on Standard Electrical Rules was held in New York, March 18 and 19. At that meeting the delegates had in their hands copies of the various codes in use and in these we find that the code as recommended by the National Electric Light Association contained a table as follows:

Gauge No.	16	14	12	10	8	6	
Amperes.	5	10	15	20	25	35	
Gauge No.	4	2	1	0	00	000	0000
Amperes.	50	70	95	100	120	145	175

This table was also contained in the code as established by the Associated Factory Mutuals Insurance Companies.

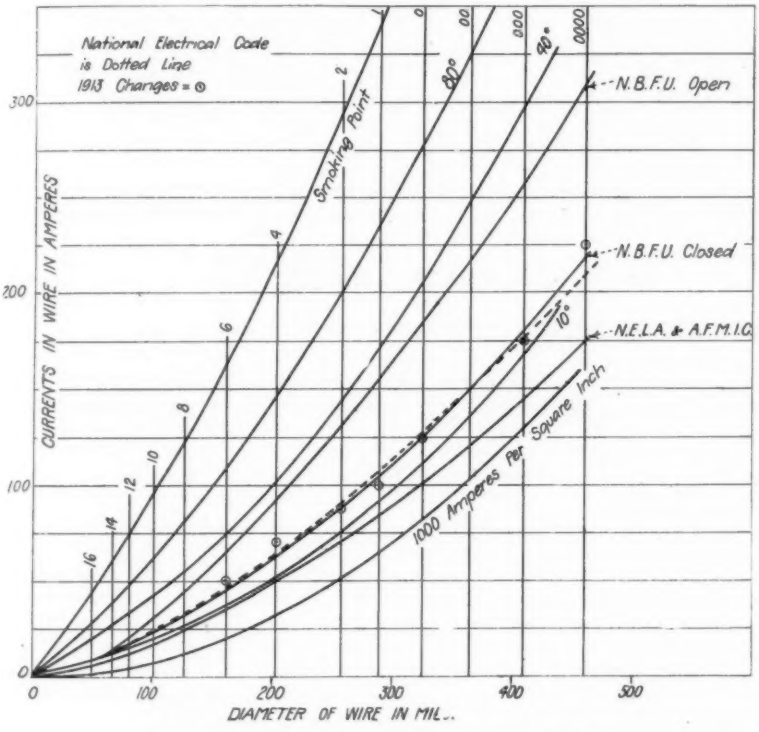
The table as contained in the code adopted by the National Board of Fire Under writers was as follows:

Gauge No.	16	14	12	10	8	6
Closed Work Amperes	6	12	17	25	35	45
Open Work Amperes	8	16	23	32	46	65

Gauge No.	4	2	1	0	00	000	0000
Closed Work. Amperes	63	88	105	125	150	181	218
Open Work. Amperes	92	131	156	185	220	262	312

The table as adopted by the first two associations mentioned was the practical embodiment of Professor Kennelly's 10-degree curve.

The table of the National Board of Fire Underwriters' was a modification of this, as was explained by its representative at the meeting as follows: "We found that if we increased the carrying capacity of No. 16 from 5 to 6 and of No. 14 from 10 to 12 we brought about an economical means of secure construction we were after. That allowed us to wire from the cabinet or center of distribution to the last lamp with only one cutout, and limit the current depending on the cutout to 6 amperes, using No. 14 wire and No. 16 cord. We did away with the fuse where the cord taps on the wire. Proceeding on that assumption, we plotted curves by Mr. Kennelly's table and straightened them out and then added certain percentages to those tables for our new tables of open and concealed work."



Curves Showing Various Ratings for Copper Wire.

Asked what was the objectoin to this table, the representative of the Factory Mutuals Companies replied: "I am not prepared to criticise it as a whole, but in making our rules we did not feel justified in adopting it for the present. As an example of the results of some tests we have made, a No. 00 wire with ordinary waterproof braid was made to carry 240 amperes. In about ten minutes the insulation had softened somewhat. You could press it between your fingers and it would show the impress of the skin lines. You could also rotate it around the wire. If you cut out a little piece the inside appeared gummy, showing the material had become more or less softened by heat. Now that current was only 20 amperes more than this table allows for open work."

In addition to these there was the rule of the Phoenix Insurance office which read: "The quantity of current sent down a conductor under normal conditions must not exceed the ratio of 1,000 amperes to the square inch of sectional area where the amount of current does not exceed 100 amperes. If in excess of that amount the ratio must of course be less.

At the same time we find that the original rule of the English Institution of Electrical Engineers' Committee (1888) had been modified to allow a temperature of 25 degrees Fahrenheit instead of 18 degrees Fahrenheit (10 degrees centigrade), as this had been found very safe but excessive in cost of installation.

Further there was the rule of the British Board of Trade, which allowed practically a 30 degree Fahrenheit rise. Also the rules of the Associated Edison Companies, the German rules, rules of the New York Fire Department, the Pittsburgh Wire Department, etc.

There was a very full discussion of the matter at the meeting of the Conference in the course of which Professor Kennelly stated:

"A wire may be considered to be safe, at a safe temperature so far as fire risks are concerned, when the hand can be steadily held closed upon it. The limiting temperature at which the hand can be borne upon a wire in this manner is about 50 degrees centigrade or 122 degrees Fahrenheit. Taking this as the safety limit and the summer temperature as 30 degrees centigrade or 86 degrees Fahrenheit, the safe temperature elevation that can be allowed for a wire is 20 degrees centigrade or 36 degrees Fahrenheit."

It was further stated that while no trace of rubber deterioration could be detected at this temperature, there were evident signs of such a result at 150 degrees Fahrenheit.

Thus we have the Factory Mutuals and National Electric Light Association rules allowing practically a ten-degree rise with a 50-per-cent safety factor; the 1,000-ampere-per-square-inch with a still greater factor; the National Board of Fire Underwriters with approximately a 25-degree rise; the English Board of Trade rule allowing a 30-degree rise; while it is recognized that a 36-degree rise will at usual summer temperature carry the wire up to about as hot as one can bear one's hand on for any length of time.

At this meeting of the Conference there was appointed a Code Committee consisting of

F. B. Crocker chairman, American Institution of Electrical Engineers; W. R. Ford, secretary, American Street Railway Association; William Brophy, National Electric Light Association and National Association Fire Engineers; W. H. Merrill, National Board of Fire Underwriters; E. V. French, Factory Mutuals Fire Insurance Companies; Alfred Stone, American Institute of Architects; E. A. FitzGerald, Underwriters National Electric Association; W. J. Hammer, (president of Conference) *ex officio*; and to them were assigned among other matters the consideration of changes and additions to the various rules. The committee met in the fall of 1896 and as one of the results of its labors there emerged a new table of carrying capacity, to wit:

Gauge No.	16	14	12	10	8	6
Amperes.	6	12	17	24	33	46
Gauge No.	4	2	1	0	00	000	0000
Amperes.	55	90	107	127	150	177	210

This set of values is, of course, well

known to us all as it is the current value of Table A of Rule 18 as it existed from the beginning of the year 1897 to March 26, 1913, when it was again modified to read as we have it now:

Gauge No.	16	14	12	10	8	6	
Amperes	6	15	20	25	35	50	
Gauge No.	4	2	1	0	00	000	0000
Amperes	70	90	100	125	150	175	225

The currents as established in the original Table A are just about 60 per cent of those necessary to carry the wire temperature 75 degrees Fahrenheit above its surroundings, or up to 150 degrees Fahrenheit from a starting temperature of 75 degrees Fahrenheit, which is assumed as the average indoor temperature. If the heating followed the I^2R-law strictly this would mean the currents of Table A would run the temperature up 27 degrees Fahrenheit, but as it does not do so the temperature will be carried up slightly more, say from 28 to 30 degrees Fahrenheit, depending somewhat on the size of the wire. At any rate this means under the assumed conditions that the wire will rise to about 102 degrees Fahrenheit or a little more, leaving a leaway of about 20 degrees Fahrenheit between the final temperature and the point where the average man finds the wire too hot to hold with comfort, which is ample to allow for fluctuations of room temperature and other inevitable variables.

As for the new ratings, it is seen that the largest change is an increase of 15 amperes (from 210 to 225) in the case of 0000 wire and as the heating is approximately as the square of the current, it would be increased in the proportion of 44100 to 50725; that is, a rise of from 31 to 34 degrees Fahrenheit according to the size of the wire, which it is seen still leaves a good factor of safety.

As for Table B of the rule, referring to insulations other than rubber, that was obtained by taking 90 per cent of the currents causing a rise of 75 degrees Fahrenheit, instead of 60 per cent thus giving a much smaller margin of safety, but all that was considered necessary, as these coverings are more a mechanical protection than a reliance for insulation.

It is interesting to note also that these values in Table A are just about one-third of those which will cause the wire to reach the smoking point.

Finally, although the changes made in 1913 look erratic, they accomplish two things: they bring the current values to multiples of 5, and they also bring them into accord with fuse ratings, which is quite important. In the diagram on page 1029 the original National Electrical Code ratings are shown by the dotted line, while to avoid obscuring the curves the 1913 changes are simply indicated on the diagram by points with small circles around them.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

Electric Line Construction. A hearing is to be held on June 10 for the purpose of adopting uniform standards for electric line equipment.

CALIFORNIA.

The State Supreme Court has denied the petition of the Commission for a rehearing of the Del Mar Water, Light & Power Company's case, mentioned in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of April 25. The Commission contended that it has the power to compel a public utility to serve a person outside of any special limits it might lay down. This power is denied by the court. Referring to its former decision, the Supreme Court says: "It does not hold that the plaintiff company is not a public utility, or that it is not engaged in distributing water for public use; it merely declares that the land of the claimant, Glass, is not, and is not found by the Commission to be, within the district or area to the use of which the water owned or controlled by that company is dedicated, and therefore that he is not entitled to demand the distribution thereof to his land." Under this decision it appears that a public utility may specify the section to be furnished with its commodity and may not be compelled by the Commission to extend its service beyond the district which it has undertaken to serve.

The Downey Light, Power & Water Company was authorized to sell its electric system in Los Angeles County to the Southern California Edison Company for $50,938.30. The purchasing company offers rates for lighting purposes considerably lower than the rates charged by the former company.

Security Issues Authorized. The San Diego Consolidated Gas & Electric Company was authorized to renew eleven promissory notes aggregating $373,228.88.

The Pacific Light & Power Corporation was granted permission to issue promissory notes in the sum of $2,500,000.

The Roseville Home Telephone Company was authorized to transfer its system to the Roseville Telephone Company for $11,000 in stock of the latter company.

The Whitney Power & Electric Company was granted authority to issue $500,000 of six-per-cent 30-year bonds. The bonds are to be sold so as to net the applicant 95 per cent of the par value plus accrued interest.

GEORGIA.

The Georgia Railway & Power Company has an application before the Commission for authority to execute a substitute mortgage to secure the $30,000,000 bond issue authorized by the Commission in 1912 and to issue $650,000 more of these bonds. The $27,000,000 of capital stock authorized by the Commission has been issued, but the bond issue has not been sold because of certain provisions in the mortgage which the company is seeking authority to change. The stock and bond issue totalling $57,000,000 was authorized by the Commission in connection with the purchase of several utility properties by the applicant company.

There is a suit before the Superior Court to declare void the order of the Commission allowing the $57,000,000 merger of the Georgia Railway & Power Company on the ground that this authorization was acquired by fraud and misrepresentation. It is alleged that certain bond issues, previously authorized by the Commission, were not used for the purpose specified.

ILLINOIS.

The Elkhart Independent Telephone Company applied for authority to materially increase its rates for telephone service. In a decision rendered on May 7, the Commission found that the increased rates for business, residence

and rural service were reasonable, but that, from the comparative data available, the proposed rates for switching service were excessive and a lower rate was named for this service.

The **Lexington Home Telephone Company** purchased the property of the Lexington Telephone Company, a competitor, and established a new rate for telephone service over the consolidated system, higher than that charged formerly by either company. The Commission issued an order on May 6 approving this rate effective as of December 15, 1913, the date of the consolidation.

NEW HAMPSHIRE.

Uniform Accounts. The Commission has under consideration the adoption of a uniform system of accounts for electric companies. A tentative classification has been formulated and a hearing is to be held before the Commission on May 26, at which time electric companies of the state will have an opportunity to offer criticisms and suggestions.

The **Laconia Gas & Electric Company** was authorized to make an additional issue of bonds to the par value of $25,000 to be used for the payment of indebtedness incurred for extensions, additions and permanent improvements to its plant and system made prior to September 30, 1913.

The **Canaan People's Telephone Company** was authorized to construct a telephone line to serve certain territory in the town of Canaan.

NEW YORK.

The **Pioneer Telephone Company,** operating in Clarence, Erie County, was authorized to issue $7,590 par value of capital stock to be sold at not less than par, the proceeds to be used to pay for new construction and to discharge certain obligations for capital purposes.

OHIO.

Bucyrus Light & Power Company. A decision was rendered on May 15 in the Bucyrus rate case. This is the first important valuation case to be decided by this Commission, and public utilities throughout the state have been interested in the investigation which has been in progress before the Commission for some months. The case arose upon application of the company alleging that rates fixed by city ordinance were confiscatory. The Commission fixed the value to be used as a basis for rate making at $95,000.

Valuation of Telephone Property. The Commission rendered a decision, May 18, fixing the value of the Central Union Telephone Company. This is the second complete appraisal of a public utility made by this Commission. It is expected that decisions in other valuation cases will be issued within a short time now that the fundamental case, the appraisal of the electric light plant at Bucyrus, has been completed. The valuation of the telephone company's property was made upon application of the city of Lancaster and is to be used as a basis for adjustment in the rates for telephone service in that city. The Commission fixed the cost of reproduction of the property at $150,983.45 and present value $126,-148.52. The company submitted estimates showing higher figures. The company has 30 days in which to appeal and in case it fails to act the city of Lancaster will adjust its rate differences upon the basis fixed by the Commission.

The Wadsworth Light & Water Company. The Commission issued an order May 15 authorizing the company to issue $4,350 of preferred capital stock to be sold for the highest price obtainable, but for not less than par value, the proceeds of such issue to be used to reimburse the company for money actually expended in additions and improvements to its plant and system.

Proposed Purchase. The Ohio Service Company has arranged to purchase the electric light and power companies in New Philadelphia, Canal Dover, Cambridge and Circleville and the proper applications have been made to the Public Service Commission.

PENNSLYVANIA.

Rules and Regulations for electric utilities were noted in last week's issue. Circulars have been received containing rules and regulations for heating, gas and water service utilities which were adopted on the same date, April 9, 1914. These rules were prepared by Prof. R. H. Fernald, University of Pennsylvania, and Prof. L. H. Harris, University of Pittsburgh.

Transfer of Property. The Commission approved the purchase of the franchises of the American Electric Light & Power Company by the Lehigh Valley Light & Power Company.

WISCONSIN.

Telephone Rates. The compilation of telephone rates of all Wisconsin companies, in force October 1, 1912, has been published in pamphlet form. This is one of a series of pamphlets containing a complete compilation of the rates of all electric, heating, gas and water companies operating within the state.

Water-Power Act. The Commission has rendered a report relative to the obstructions to navigation in the Beaver Dam River in the city of Beaver Dam. The report is submitted to the governor in accordance with the provisions of the Water-Power Law. The Governor, if he approves of the Commission's findings, instructs the attorney-general to institute proceedings in the name of the state.

Earl Telephone Company versus Trego Telephone Company. The Commission decided that the Trego Telephone Company was not in violation of the statute prohibiting the paralleling of telephone lines when it built its lines along the same route as the Earl Telephone Company for over a mile. It appears that poles had actually been delivered to the place where they were to be erected prior to the passage of the act, although the actual setting of the poles and stringing of the wires was done subsequent thereto. Since the buying of the poles and delivering of the same was a considerable portion of the construction expense the Commission held that the line was in course of construction previous to the time the statute took effect. The Trego Telephone Company is cautioned, however, that it must receive permission from the Commission before any further extensions can be made in the territory of the Earl Telephone Company, especially at the terminus of its line in Spring Brook where the Earl Telephone Company now has subscribers.

Municipal Appraisal of Cincinnati Central-Station Property.

For the purpose of making an accurate appraisal of the properties of the Union Gas & Electric Company, of Cincinnati, O., to use as a basis in fixing electric rates, the city has taken steps to employ A. C. King, deputy commissioner of gas and electricity of the city of Chicago, at $50 a day and expenses, to supervise the work. The Cincinnati Chamber of Commerce has taken a hand in the matter, and will probably suggest the employment of other experts for other purposes, on the ground that numerous other factors are involved in the fixing of rates.

Valuation of Public Utilities in District of Columbia.

Preliminary arrangements for the establishing of valuation of the properties of the public utilities corporations in the District of Columbia were recently made, following the arrival from Chicago of Andrew Sanster and Robert McArthur, who will be employed in the work as chief accountants. They will be under the direct supervision of Edward W. Bemis, to whom the Public Utilities Commission recently awarded a contract for the valuation of the electric street railways, the electric-light plant and the gas plant.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 218.—PANAMA CANAL LOCOMOTIVES.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

No. 221.—QUARTZ LAMPS ON ALTERNATING-CURRENT CIRCUITS—Why can the ordinary quartz-tube lamp not be used on alternating-current circuits? Are any such lamps available for these circuits?—B. W., Denver, Colo.

No. 222.—INDUCTION MOTORS.—1. With a given set of coils and a three-phase induction-motor stator, is there any rule by which the proper coil pitch can be determined other than approximating by placing the coil in the slots? 2. What effect on the power-factor, efficiency and speed will changing the coil pitch give on induction motors? 3. With a given winding in an induction-motor stator, what effect on power-factor and efficiency will changing the connections from Y to delta have and vice-versa?—A. C. H., Security, Md.

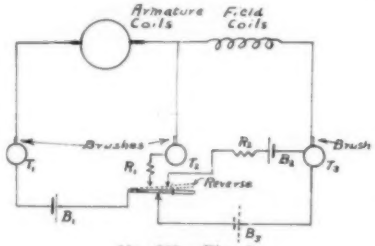
No. 223.—STREET OR STATION INDICATOR.—Is there on the market an automatic device, usable inside of street cars, that will automatically, through electrically illuminated signs in each end or one end of the car, indicate intersecting streets by name as and when the car approaches such intersecting streets, irrespective of the number of such streets, and is the same practicable? Where is such a device used and by whom manufactured?—W. H. W., Kansas City, Mo.

Answers.

No. 219.—REVERSING ELECTRIC TOY TRAIN.—Some electric toy locomotives are made to reverse by means of a reversing switch on the locomotive, but this requires stopping the train and changing this switch. Is it possible to arrange the outfit so that reversing can be done from the control station without touching the locomotive? I have been told it would require four rails for each track. Can this be done with only the three rails usually provided?—D. H. S., Rockford, Ill.

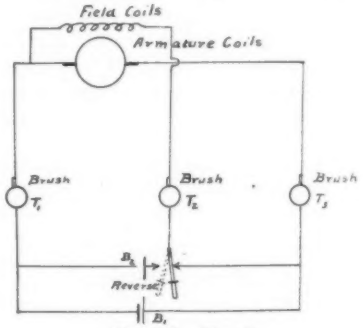
It must be remembered that in order to reverse the direction of rotation of an electric motor it is necessary to reverse the direction of current in *either* armature or field. This condition requires that one rail feeds the current into the field in one unchanged direction, and the current coming out of the field must go to the armature in either of two directions, as is required by the direction of rotation. It is obligatory that this outcoming field current must come on another rail to another externally controlled switch which will direct the current in and out of the armature by means of two additional rails. In other words, four rails are needed to permit reversal from the control station, if a motor with electromagnet field is used. However, if a motor with a permanent-magnet field is used, the field is not connected to the circuit at all and two rails insulated from each other will serve the armature and permit reversal of its current. Or the two main rails may serve as one side of the circuit and the third rail as the other.—W. M. P., Seattle, Wash.

It is assumed that the toy railway motor referred to is a direct-current motor operated on dry batteries or a few cells of storage battery; further, that the three rails of the track are insulated from each other, and are not brought into electrical contact with each other by the axles or other parts of the engine or cars, also that brushes are placed on the engine or cars for the express purpose of taking current from the rails; and further that current taken from the rails by the brushes may be from them conducted through the various coils comprising the motor windings, in any desired manner. All direct-current motors consist electrically of two main parts, the armature which usually is the rotating member and the field which is usually stationary. It will be necessary for you to first examine your motor to determine whether the field coils are connected in series with the armature or in parallel with the armature.



No. 219.—Fig. 1.

In case the coils are all connected in series the arrangement shown in Fig. 1 will enable you to reverse the motor without touching the engine. It requires making use of only the three rails and an extra battery, almost run down or of lower voltage than the battery ordinarily used; or an extra battery identical with that ordinarily used together with resistance as shown. The value of the resistance or lower battery voltage for the extra battery is to be determined as follows. Resistances at R_1 and R_2 must be adjusted so that when the motor is running reversed the armature or field coils will not heat more than ordinarily. In case you have no resistances of a suitable character available, old run-down dry batteries connected in opposition to battery B_1 at R_1 and in opposition to battery B_2 at R_2, so that the coils will not overheat as outlined above, will serve the purpose. If a sufficiently run-down battery, or new battery of proper voltage not to overheat the field coils is placed at B_2, no resistance or opposing battery need be placed at R_2. Also if battery of a sufficiently low or weak voltage can be placed at B_1 the resistance or opposing battery at R_1 may be omitted by placing a battery at B_3 such that the voltage of B_1 plus B_3 is equal to the voltage normally used. In reversing the motor, you should not throw the switch into the reverse position until the motor has stopped.



No. 219.—Fig. 2.

It may be stopped quickly by arranging the battery switch for battery B_1 so as to cut off the battery and short-circuit rails T_1 and T_3. Neglect of this point regarding reversing the motor while battery is on and it is still running in the original direction might result in serious damage due to overheating of the coils.

If the armature is connected in parallel with the field, the motor may be connected as shown in Fig. 2. The batteries B_1 and B_2 are to be of the same voltage as normally used. The same precautions regarding reversing with the battery connected and the motor rotating in the original direction apply in this case as in the case of the serially connected motor above; and the same procedure will produce the same brake effect. The general theory of the arrangements shown in Figs. 1 and 2 hinges on the fact that it is necessary to reverse the field coils relatively to the armature coils in order to reverse the direction of rotation of a direct-current motor.—R. L. W., Hackensack, N. J.

No. 220.—PATENTABILITY OF COMBINATION INVENTION.—If a person invents an entirely new device by bringing about, after prolonged experimentation, a very difficult but successful combination of parts already in use, can a patent be secured on the new device? For example, I have been told that the new nitrogen-filled tungsten lamp cannot be patented because nitrogen and other inert gases had already been used during the early development of incandescent lamps and concentrated tungsten filaments have been employed in standard tungsten lamps for a year or more. Is this matter covered by the patent laws or has the practice been determined by the courts?—J. W. T., Toledo, O.

An invention composed of old or well known elements is patentable whenever their combination enables them to produce a new result, or a familiar result in a different way. However, the mere aggregating of old features into a more desirable combination in which each constituent performs its old function in the same way in which it performed it formerly, generally requires only the exercise of common sense and hence will not form the basis of a patent, even though the result is superior to what was formerly on the market. Thus, in the case cited by J. W. T., both nitrogen as a substitute for air in an incandescent-lamp globe and tungsten as a filament for such a lamp are old, hence the combination of the two would not be patentable. Generally speaking, any combining of old features which only requires ordinary mechanical skill to effect the same, is not patentable in this country. However, there may be exceptions to this general rule, as evidenced by a decision of the Court of Appeals of the District of Columbia (*In re.* Merrill, O. G. 199, p. 618), in which the court held that "Patentability will often be presumed from the fact that a device, although apparently disclosing but the mere exercise of mechanical skill, produces a result long sought after, but for the first time attained." Moreover, the inventor does not always grasp all of the principles involved in his new process or device, as viewed from the standpoint of the Patent Office, hence an experienced patent attorney can often point out a proper basis for patentability where none would appear to a layman, thereby helping the latter to the protection which ought to accrue to him for his contribution to general progress.—Albert Scheible, Chicago, Ill.

If a person creates an entirely new device by the combination of parts already in use for other purposes, the device can be patented if the combination is really a new one. The famous Selden automobile patents are a case in point. The inventor claimed as his invention "The combination with a road locomotive, provided with suitable running gear including a propelling wheel and steering mechanism, of a liquid-hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid-fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device and a suitable carriage body adapted to the conveyance of persons or goods." An analysis of this first and main claim shows that the machine consists of the following parts: (1) running gear; (2) gas engine; (3) fuel receptacle; (4) power shaft; (5) clutch; (6) carriage body. Each of these parts was well known and in common use at the time and the invention consisted in combining them to produce a previously unknown vehicle, and a patent was granted.

The question in regard to the patentability of the new nitrogen-filled lamps is one of priority. In this lamp we have the following elements: (1) an electrically heated incandescent filament, (2) the glass bulb, and (3) an inert gas filling the bulb and entirely surrounding the heated filament. The invention claimed is the combination of these three elements and if the combination had not previously been made it would be patentable now. The requirement that an invention must be *new* and *useful* is a statute requirement.—F. E. V., Madison, Wis.

Civil Service Examination for Expert Radio Aid.

The United States Civil Service Commission will hold an examination at the usual places on June 17 for eligibles to fill a position as radio aid in the Navy Yard in New York City and in similar service. The duties of this position are: to direct and assist in the laboratory standardization tests of all circuits, instruments, and apparatus pertaining to and used in radio signaling; the practical installation, repair, and adjustment of radio apparatus both in shore stations and on ships; the development of special apparatus and methods of radio signaling suited to special conditions, and of new forms of sending and receiving circuits; to inspect the various radio stations when called upon and to make the necessary measurements of their electrical constants; and in general to carry out such work as may be necessary for the development of radio apparatus. The aids will be required to prepare technical reports of inspections, tests, and experimental research work. The salary is $6 per day.

The examination will deal with theoretical and practical questions in the construction, use and adjustment of radio apparatus. Weight in the final selection will also be placed on technical training and experience of the applicant. Applicants should be graduates of technical schools of recognized standing and have taken a course in electrical engineering and a special course in wireless telegraphy; also should have had several years' experience in the manufacture or installation and adjustment of wireless apparatus and in theoretical or practical research work. It is further desirable that they should be operators, but this is not necessary.

Applicants must be men of 21 years or over, and should write to the Commission at Washington for application form 1312.

Civil Service Examination for Electrical Engineer and Draftsman.

The United States Civil Service Commission will hold an examination on June 3 and 4, for electrical engineer and draftsman, to fill vacancies in the office of the Supervising Architect, Treasury Department, Washington, D. C. The salary of this position is $1,200 per year. On the first day the examination will be devoted to questions on electrical science, covering particularly lighting and elevator service in public buildings. The second day will be devoted to drawing and design of electrical apparatus and machinery for public buildings. Training and experience will also be taken into account.

Applicants must have a good common-school or high-school education and not less than three years' special experience as draftsman, principally in connection with electrical work, or be technical graduates with not less than ten months' experience as electrical draftsman or practical experience in the installation of electrical wiring or apparatus. Applicants must be men 22 years of age or over. Application Form 1312 should be sent for and filled out.

Electrical Progress in Argentina.

The rapid progress that the electrical industry is making in Argentina can be seen from comparing the imports of electrical machinery and appliances during the past five years, these having been as follows: 1909, $4,069,322; 1910, $5,540,576; 1911, $6,449,744; 1912, $9,272,477; 1913, $9,576,235. The principal articles of import have been: cables, insulators, wire of all classes, carbons, dynamos and motors, switches, arc lamps, incandescent lamps, meters, and accumulators.

Valuation of Utah Power Companies.

The State Board of Equalization at Salt Lake City, Utah, has finished the compilation of the valuation of the properties of public utility companies in Utah, based upon the assessment made on January 1 of this year. The valuation of the principal lighting and power utilities are as follows:

Utah Light & Railway Company	$3,267,580
Utah Power & Light Company	2,405,925
L. L. Nunn Properties	55,415
Beaver River Power Company	100,275
Total	$5,929,195

ELECTRICAL EQUIPMENT FOR INDUSTRIAL PLANTS.

By Harry C. Spillman.

Few manufacturing plants realize the important fact that modern electrical equipment is one of the best kinds of insurance both in respect to fire and continuous production. The entire operation of a plant depends upon the power supply, and in case a single motor stops it directly affects the output.

A number of shutdowns and delays can be avoided by the proper selection of electrical equipment and by having the installation planned to possess the inherent qualities necessary to stand an enormous amount of abuse.

The layout and installation of the wiring for an industrial plant should receive the same careful attention as

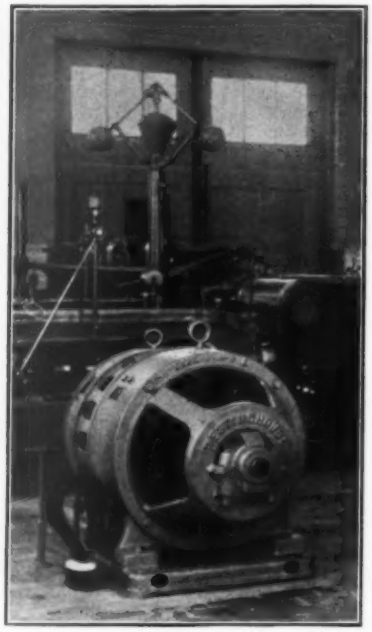


Fig. 1.—A Job Made Attractive by the Use of a Conduit Fitting.

the layout of departments and the selection of machine tools. Unfortunately, the wiring is not considered until the buildings are nearly ready for occupancy and the rule of thumb methods are given preference over a careful study and systematic layout. When designing an installation it is far better to analyze every condition, including the shortest and best methods for running the feeders, the size of the wires both for present and future requirements, the choice between open wiring and steel conduit, and method of reinforcing the feeders for future demands. The voltage to be adopted and the question of using alternating or direct current must also receive careful attention.

The choice between alternating and direct current is a problem which can only be solved by knowing all the conditions to be met. When a plant does not demand variable-speed motors, alternating current will prove very satisfactory, as the voltage can be easily raised for long-distance transmission and it allows a higher voltage for motors than for lighting without a great loss. Alternating-current motors give less trouble than the direct-current type and they require less attention.

The voltage adopted depends upon the size of the plant and local conditions. Sixty-cycle, three-phase, alternating current works out the best for the average industrial plant, as one generator and one set of buses will supply both lamps and motors. For a small plant covering an acre or less the best voltage is 110 volts, which will take care of both the motors and lamps without balance coils or transformers. If the plant does not cover over 30 acres, 220 volts is correct. This voltage allows the use of 110-volt lamps by using balance coils, which are considerably cleaper than transformers. In case the plant covers over 30 acres of ground, but does not exceed a square mile, 440 volts is the best. This voltage will demand the use of transformers for the lighting circuits.

In case a power house is to be erected in connection with the plant, arrangements should be made with the local lighting company for a throw-over service which will take care of the load on Sundays and overtime. This service will also prove of great value in case of a breakdown in the power plant.

The power requirement is the greatest problem to be solved and unfortunately, data for power requirements for group drive are not available. Very little research work has been done in this line. An engineer has to work out his own load requirements. Most machinery builders can furnish power requirements for direct drive, which represents the maximum power demanded for their machines. When a number of machines are driven from a line shaft a portion of the machines are idle, others are taking a light cut and the remainder are demanding a range of power up to the maximum. If 40 per cent of the total maximum power for all the machines is taken it will give very close results for the power requirements. Recent tests of a modern machine shop show the amount of power necessary for group drive.

Per cent of machines in operation	71
Total average power per square foot of floor space	13.4 watts
Line shafting and counter shafting per linear foot of line shafting	25.3 watts
Power consumed by line and counter shafting per square foot of floor area	4.11 watts
Total friction losses, all machines running light, per square foot of floor area	9.98 watts

Floor area includes floor space occupied by machines and space allotted for the operators and storage of material around the machines.

The selection of the sizes of the motors should next be considered and it is an excellent idea to standardize the

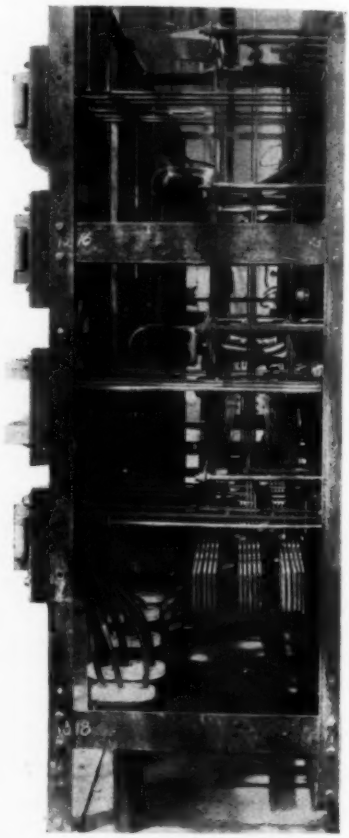


Fig. 2.—Conduit with Conduit Fittings Behind a Switchboard, Thus Avoiding Tangled Wires.

equipment as far as possible. A large automobile company recently built a new plant and they adopted one make of motors. All the motors in the plant run at 1,200 revolutions per minute; and 1, 5, 10 and 20-horsepower motors are used exclusively. This eliminates carrying a large number of spare motors in stock, and in case of a breakdown the new motor will drive the shafting at the right speed without changing the pulleys or belting.

The lighting load can be very accurately obtained by deciding upon the kind of illumination and the number of foot-candles required at the working plane.

After the power requirements are obtained, drawings should be made show-

ing the approximate location of each motor and lamp, and the location of each power and lighting cabinet. With this layout the length and size of the feeders can be determined very accurately. These drawings should show the size of each feeder and its entire run. The values of these cannot be overestimated as they will prove a quick and accurate method for obtaining the material and will be a great help when the installation is started. It will also serve as a permanent record of the work. It is good practice to allow a five-per-cent drop in the transmission circuits when they are fully loaded and a three-per-cent drop in the branches. The feeders should be of sufficient size to take care of the future load during the next four or five years. Each building should have separate feeders and the lighting circuits should be independent of the power circuits. This will give a more flexible arrangement and a far better layout. In case of trouble it can be more easily located and it allows each building to be independent of the others for power and light. When the layout of the feeders is planned it is far better to run the wires out of the way of belting, shafting and other obstructions, and conduit should be given preference over open work. If the wires are in conduit there is less danger of grounds, the wires are far better protected, less room is required and the installation is more attractive. The illustrations which accompany this article show the use of conduit fittings which further add to the appearance of the installation. It is advisable to place a tee or cross at intervals in all the feeder lines to allow future branches to be taken off without cutting into the conduit.

The mounting of motors has never been given the proper thought. A motor is usually suspended from the ceiling or else installed on the floor. There are a number of disadvantages of placing the motor on the ceiling. It is the hottest place in the room, and this lowers the efficiency of the motor; it is very difficult to install, and as it is located in an out-of-the-way place it is often neglected. It is almost impossible to repair a motor in this location, which is a great disadvantage. The great objection to placing a motor on the floor is the valuable floor space which it occupies and the danger of the belt. Fig. 3 shows an excellent method for taking care of a motor. The platform is made in one piece and bolted to the iron brackets, which are made of angle-iron, clamped to the column. In case it is necessary to change a motor it can be easily accomplished by means of a chain falls. Fifteen minutes is the usual time allotted to remove a motor and replace it with a new one. The predominating factor is speed,—when a department is idle due to motor trouble,—and the motor platform solves the difficulty. The motor is also out of the way and easily accessible. The small air hose shown is connected to the high-pressure air line which is used to blow out the windings and keep the motor dust free.

The use of adjustable relays for protecting motors is far better than fuses, as it allows a motor to be started immediately in case it stops from an overload. It also saves the cost of renewing fuses, which is a large yearly item. Its adjustable feature is another great advantage. The starting boxes on a motor should have a no-voltage release and in case of an alternating-current motor it should be designed for one-minute starting duty and the working parts should be immersed in oil.

Metal should be given preference over wood for all cabinets and junction boxes. All fuses should be mounted on porcelain on slate bases and inclosed in a metal box. It is also best to standardize on one style of fuses for the entire installation.

These items are necessary to make a successful installation and they will repay many times their initial cost, as the installation will be free from the many annoyances which are continually causing trouble and shutdowns in many electrical equipments. The additional cost will not exceed 15 per cent, which is a small item considering the smooth running qualities of the installation.

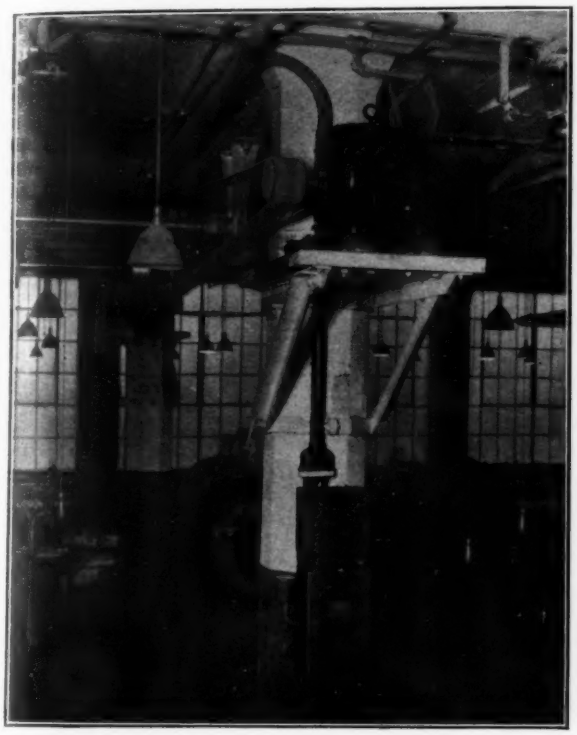


Fig. 3.—Showing Method of Mounting Motor for Group Drive on Column.

Fig. 4.—Ten Conduits Carrying 30 Lighting Circuits Away from a Cabinet.

Plans Formulated for Work of The Society for Electrical Development.

The Society for Electrical Development, Incorporated, has completed not only its organization and staff, but also the plans for its first year of work, which has now actively begun.

Everybody—the great public, the manufacturer of anything for which power is used in the making, everybody in the electrical industry, whether making, selling or installing electrical apparatus or making and distributing electrical current—is interested in knowing what, how and why things are done electrically, and what, how and why other things should be so done.

The dissemination of such information among the men in the industry and to the consumer of the industry's product, is one of the chief activities of The Society for Electrical Development and is undoubtedly the most effective work possible for developing further uses of and an increased demand for electricity for power, light and heat.

The public needs education as to the possible uses of electricity for light, heat and power, and the plans adopted by The Society for Electrical Development for its first year's activities indicate some of the methods by which the Society proposes to carry on this necessary work, and at the same time to furnish valuable information to its own members.

These plans have been formulated as follows:

Section I—Field Co-Operation.

Local Co-operation. Forming and Stimulating Local Organizations.—The plan is to organize the allied interests into local leagues, to secure the personal support and co-operation of the members of the Society in each district, so that they will all work together for the intensive cultivation of the electrical business in the territory in which the local organization is formed.

Part of this local work is to be done through co-operative advertising, through aiding in local legislation, local inspection of wiring, local wiring codes, etc.; also through being able to present to the local governing body ordinances regulating electric signs, street lighting, etc., in other cities.

This department is also prepared to co-operate with the local interests in the preparation of electrical pages and to furnish information regarding electric shows.

Covering Conventions.—It is intended that the Society shall take an active part in conventions not only of electrical interest, but in all conventions where users of electricity get together. Arrangements are to be made for papers to be presented by representatives of the Society on some application of electricity of interest to that particular convention.

General Co-operation.—The field representatives of the Society will devote a portion of their time to co-operation with architects, builders and engineers, so that these may be informed as to the proper method of writing specifications for installations for electric light, heat and power, so that the specifications will embody the use of *everything electrical* that is available on the American market.

As the text books used in public schools on electrical subjects are very apt to be behind the times, this department will co-operate with the publishers of text books with the view of bringing them up to date.

It is also the intention of the Society to co-operate with school boards by furnishing motion-picture films, lectures and stereopticon exhibitions showing the progress in the world of electric service. In this work the local central-station company is expected to actively co-operate. Visits to large manufacturing plants where electric drive and other uses of electricity could be pointed out, will also be arranged for high schools.

There are numerous business-men's associations in our cities, and by putting jobbers, contractors, manufacturers and central stations in closer touch with these boards of trade, chambers of commerce and other business-men's associations, great good can be accomplished.

This section will continue the campaign for membership and in a general way keep the allied interests fully posted on the work of the Society.

Section II—New Development.

The Society has engaged as a traveling investigating engineer a man whose experience in the electrical field has particularly fitted him for the work of compiling up-to-date information as to the various uses of electricity in the different industries, and suggesting every possible use of electricity for light, heat and power in factories, mills, etc., as well as in the home and on the farm.

It is very difficult at the present time to secure such information; some of it has been published in different periodicals, but it has not been brought together in a comprehensive way. Information as to the requirements of power in the various industries, together with the price per unit of output that the consumer could afford to pay for power, would be invaluable to central-station companies. Analyzing the application of electricity to the industries will undoubtedly show that none of them has been equipped to the limit of possibility, and the Society proposes to make practical suggestions as to the further uses of electricity in all industries.

There is a great work to be done for central stations throughout the country in developing an increased demand for electric service in the home. This can be done to a large extent by securing and disseminating information among the central-station members as to how such a demand has already been developed elsewhere, and outlining new-business campaigns.

There are innumerable examples of heating throughout the country, but the number of them in use in proportion to the prospective list is absurdly small. There is no place where one can obtain information covering what has been done in this connection, much less what might be done. The Society for Electrical Development can help central-station companies to get this kind of business, and can bring the manufacturer, central station and dealer together in the production and sale of such apparatus; the assistance so rendered will alone justify membership in the Society.

The work which this section outlines is one that cannot be accomplished through any other medium than The Society for Electrical Development, except at an expense which prohibits any one company attempting it: and this work will create a feeling among manufacturers of all classes that electricity is adaptable to most processes requiring heat, light and power in their establishments.

Section III—Commercial Exchange Bureau.

This section will work in very close co-operation with Section II, and the Society has engaged as manager of this bureau an electrical engineer who is thoroughly capable of collating, indexing and filing the information gathered by Section II and from all other available sources.

This bureau will prepare bulletins or pamphlets explaining the various uses of electricity, prepare data for articles of similar character for the trade journals and for convention papers, and carry on the necessary correspondence upon such subjects with the members of the Society and the public.

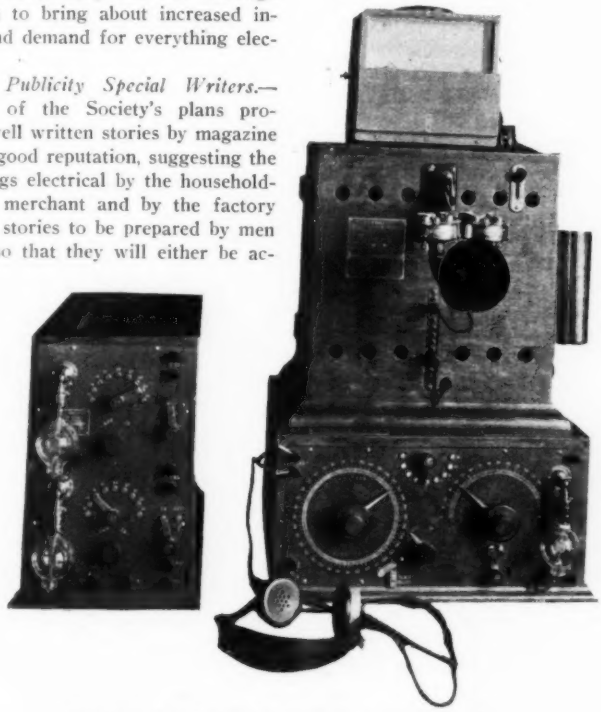
As an example: if the engineer in charge of Section II investigates an industry and finds that electricity has been used to some extent in that industry, but that it is capable of much further and more extended use, his report to the Commercial Exchange Bureau will contain all the information obtainable on the present uses of electricity, how and why it is used, together with suggestions as to what more could be done electrically, how and why it should be so done. This information will be properly filed and indexed by the Commercial Exchange Bureau and will be available for the use of our members. An article or articles will be prepared, dealing with the uses of electricity and its possible extension in that particular industry. The artcles will be supplied through the Editorial Department to one of the leading trade papers in that industry and will be reprinted and sent out in pamphlet form to the biggest manufacturers engaged in that industry, and to the central stations.

Section IV—Editorial and Advertising.

News Items and Electrical Stories for Local Papers.—Describing electrical inventions, improvements or applications compiled in news form so that electrical stories will be accepted by the press on their merit as news.

The Society plans to provide an advertising copy service for members of the Society to assist them in conducting their advertising in the best possible manner; also to carry on discussions in regard to newspaper advertising before meetings of the Electrical Contractors' Association, the Electrical Supply Jobbers' Association, the National Electric Light Association, etc., so that the greatest number of concerns engaged in the electrical business will be informed upon the value of newspaper advertising and how through this means to bring about increased interest in and demand for everything electrical.

General Publicity Special Writers.—This part of the Society's plans provides for well written stories by magazine writers of good reputation, suggesting the use of things electrical by the householder, by the merchant and by the factory owner, the stories to be prepared by men of ability so that they will either be accepted on their merits or be sufficiently interesting to be paid for by the publishers and in this way cut down the cost to the Society of having this work performed.



Wireless Telephone Set Used by Lackawanna.

Moving Pictures.—The Society has arranged for the preparation of moving pictures suggesting the use of things electrical, illustrating their uses in the home, factory, and on the farm. This is one of the most effective methods of interesting and educating the public to "Do It Electrically."

Window Trimming.—The Society has arranged to have a number of windows trimmed with electrical supplies, the displays to be made in a novel and effective manner, two photographs to be taken, one showing the fixture setting and the other showing the completed window. These photographs are to be reproduced in half-tone and sent to the members of the Society who have show windows, together with printed instructions as to how to dress the windows to obtain the effects shown in the photographs. Such photographs and instructions will be sent out at regular intervals during the year, and it is felt that this work will give the smallest and the largest member a concrete exhibit of the definite help that the Society is in a position to furnish its members.

Radiotelephony on Lackawanna Railroad.

Since the signal success which attended the wireless telegraph installations at division headquarters on the Delaware, Lackawanna and Western Railroad during the nine-day paralysis of their wires by a blizzard, the officials of that system have been investigating the possibilities of telegraphing and telephoning to their moving trains. With Marconi telegraph transmitters communication was maintained from a passenger train up to 60 miles, and from 100 to 207 miles from a track-side station to the train. In all this work the audion was the detector used.

Figuring that the wages of the special Morse operator necessary to operate the train telegraph amounted to 6 per cent per annum on $15,000, L. B. Foley, superintendent of telegraphs for the railroad, accepted the proposal that the Radio Telephone & Telegraph Company install the new de Forest wireless telephone at Scranton, Pa., and on one of the through fast trains.

The Scranton installation, though hurriedly made, was able on its second trial to maintain clear voice transmission to this train up to Stroudsburg, Pa., a distance of 53 miles, the train running 60 miles an hour.

The antenna at Scranton is 300 feet long and has an elevation of 150 feet. That on the train extends over the four forward cars only, the wireless station on board being in the second car from the locomotive.

Train noises render it imperative to use the audion amplifier with the audion detector. A two-step amplifier, giving from 50 to 60 times amplification, is used on the train.

The permanent train installation is now being prepared. The generator is direct-connected to a steam turbine in the baggage coach, supplied from the steam-heating pipes beneath the car.

At the Scranton station direct current is supplied, at 125 volts.

The present apparatus is of only one kilowatt capacity, but not the slightest difficulty is had in telephoning from Scranton to Binghamton, a distance of 67 miles, over rough wooded and mountainous country.

The officials of the railroad propose to make these installations a permanent part of their two best train equipments, for facilitating despatcher's service, and especially for the convenience of the travelling public. Messages will be handled at a fixed rate, as with the telegraph, but telephoned by a regular member of the train crew.

Hydroelectric Plant for Manila, Philippine Islands.

The development of water power for furnishing electric light and power for Manila and suburbs is to be undertaken by the Manila Electric Railway & Light Company, the concern now furnishing light and power and operating the street-railway system in Manila, if the new Public Utilities Board of the Philippine Government accedes to the proposal of that concern through Charles M. Swift, who has applied for a franchise. It is generally understood that the Government will grant the franchise, arranging for the reversion of the Govenment in due time. The poposal is for the development of power from the Caliraya River and its tributaries in the Province of Laguna, near Manila, the company also proposing to develop other power possibilities in various portions of the island of Luzon when the plant for power needed in Manila has been completed. The electric light and power system in Manila at present is by far the most modern and efficient in the Far East, but the power is developed from Japanese coal.

Brightness.

A meeting of the Chicago Section, Illuminating Engineering Society, was held on the evening of May 13, at which M. G. Lloyd, chairman, presided. William A. Durgin gave the final one of his short illustrated talks that had been continued during the season's meetings and which touched on the fundamentals of illumination. In the concluding talk, Mr. Durgin dwelt particularly on the characteristics of various types of arc lamps. Announcement was made that the next meeting, which will be held on the evening of June 10, will be a joint meeting with the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers. Two papers will be presented at this meeting; one by P. E. Haynes, dealing with developments in Chicago street lighting, and another by Prof. A. H. Ford, of Iowa State University, dealing with the illumination of electric signs.

The main paper of the evening was entitled "Brightness," and was presented by J. R. Cravath, of Chicago. The relative brightness of surfaces we observe and the amount of light they emit are of primary importance in comfortable illumination. As yet, however, the term brightness has not been used as commonly as illumination intensity or foot-candles. Any object in order to be visible, must have a certain brightness. The author used the term brightness as synonymous with intrinsic brilliancy and surface brightness, it being the amount of light emitted per unit of area, and expressed preferably in candlepower per square inch. Brightness is independent of distance. A reflecting surface that is a perfect diffuser has the same brightness in all directions. The brightness of a surface varies directly as the incident illumination and as the reflecting power of the surface. In the case of perfect diffusers it can be readily calculated. Mr. Cravath explained the very simple method of measuring brightness by means of a compact form of Sharp-Millar photometer. The instrument must be pointed directly at the surface to be measured. The results, while only approximate, are sufficiently accurate for most practical purposes.

Included in Mr. Cravath's paper was a long table giving the results of brightness measurements of light sources and of illuminated surfaces under various conditions. A striking result brought about by such measurements is the extraordinary differences in brightness within the range of ordinary vision to which the eye is frequently subjected. In a small room lighted by a bare tungsten lamp, the brightness of the filament is about 1,060 candlepower per square inch, while the walls may have a brightness of only 0.00015, which is a ratio of about 7,000,000 to 1. On a sunny day the brightness of the sun is about 500,000 candlepower per square inch and the surrounding blue sky may have a brightness of 2.15, which is a ratio of 230,000 to 1, thus presenting much less contrast than with bare artificial sources. The eye readily adapts itself to extraordinary changes in brightness in the central part of the field of vision and the changes in brightness of daylight on an ordinary day are almost unnoticed, even though they may be numerically quite high. Mr. Cravath gave results of brightness measurements in rooms lighted by daylight and also of rooms equipped with various types of artificial lighting. In indirect artificial lighting the brightness differences in the field of vision approximate those with daylight from north exposure. A type of room in which conditions are very trying is one in which all of the daylight comes through a single rather small window.

An investigation was made of the relative brightness of indelible pencil, black pencil and ink marks on different kinds of paper. It was found that the indelible pencil in some positions has almost the same brightness as the paper, and, therefore, is practically illegible. Ordinary writing ink makes a less glazed mark than either a black or indelible pencil and is, therefore, preferable for comfort. The common opinion that printing on white paper presents the maximum contrast which the eye can perceive is erroneous, since it is very doubtful whether a brightness ratio of 20 to 1 is exceeded in printed matter. The eye is better able to judge of differences of brightness between the surfaces if these are brought closely together, therefore, a sharp and clean-cut type is more easily read.

The discussion of the paper was rather brief. Prof. Morgan Brooks called attention to the greater contrast in the patterns of textile materials that have intermediate colors between white and black. He also dwelt on how the architectural effects in a room or building can be enhanced or diminished by attention to the relative brightness of illumination on adjoining surfaces. Ward Harrison spoke of brightness effects as related to photometric measurements. A. Scheible commended the paper on account of its originality and importance and suggested that a separate meeting be held for discussion.

The United States, according to the last census, has nine telephones per hundred inhabitants. Germany has two telephones per hundred inhabitants; Holland, two; Switzerland, two; Great Britain, 1.5; Belgium, 0.8; and France, 0.7.

Association of Supervising Electricians Formed in England.

An association of managers, supervising engineers, and permanent foremen attached to the electrical contracting trade, has been formed in England. The objects of the Association are: (a) to assist members in obtaining information of situations; (b) to form a technical library for the use of the members; (c) to form a benevolent fund for the assistance of members in distress; (d) to endeavor, by means of lectures and visits to large works, to maintain a high standard of efficiency of all members; (e) to foster the apprentice system for learners in the electrical trade; (f) to endeavor to extend the attendance of electrical workers to evening schools, both technical and practical; (g) to arrange the reading of papers on electrical subjects by members or visitors, invited from other societies; (h) to arrange periodical social gatherings to promote knowledge and good fellowship amongst members.

At the preliminary meeting at which the formation of the Association was decided upon, it was agreed that, in order to become members, foremen or supervising engineers would have to have been employed in the electrical contracting trade a certain time, during part of which they must have been actually acting as foremen or supervisors of work.—*Electrical Engineering* (London.)

Address by Long-Distance Telephone.

The Rev. Charles M. Sheldon, of Topeka, Kans., while in that city recently delivered an address by telephone to the Kansas State Editorial Association which was in annual convention at Manhattan, Kans. The 52 miles intervening was spanned by courtesy of the Bell Telephone Company, at Topeka, which arranged a special megaphone device at the end of the line where the audience was stationed. By this means every word of the speaker was heard distinctly. Electric light globes further assisted the audience by indicating the emphasis placed on each sentence by the speaker.

Co-operative Telephone News Service.

H. E. Lindas, president of the Arkansas Valley Telephone Company, of Dodge City, Kans., has arranged to give newspapers in towns covered by his company free news service. The plan is to form a co-operative news bureau, the editors in twelve towns being members. Each editor telephones to the central office the principle news of the day, and attachés of the main establishment distribute the news as it comes in. This service will be free.

Mississippi Electric Association.

The annual convention of the Mississippi Electric Association was held in Meridian, Miss., April 27 to 29. This was the most successful meeting ever held by the Association. Six regular sessions were held at which were presented a number of papers dealing with tungsten-lamp manufacture, boiler economy, lubrication and other pertinent topics. The election of officers took place at the final session and resulted as follows:

President, A. H. Jones, of McComb City, Miss.

Vice-President, Charles Hays, of Columbus.

Secretary and treasurer, H. F. Wheeler, of Hattiesburg.

Executive Committee: R. B. Claggett, W. F. Gorenflo, E. B. Booth, A. B. Paterson, A. H. Jones, R. H. Smith and Charles Hays.

It was decided to hold the next annual convention at Hattiesburg, Miss., on April 12 to 14, 1915.

Another Successful Rejuvenation at Dayton.

The third rejuvenation of the Dayton, O., Jovian League, which was held at the Dayton Club, in that city, May 9, was highly successful, 42 candidates being initiated in the presence of a large number of members and visitors. The Dayton degree team conducted the ritual, the following officiating: Jupiter, Alternate Statesman F. K. Bybee, of the Erner & Hopkins Company; Neptune, D. K. Funkhouser, of the Dayton Power & Light Company, Pluto, Arthur Gibbons, of M. J. Gibbons & Company; Vulcan, H. H. Wollaston, of Wollaston & Waxler; Mercury, C. A. Kuebler, of the Westinghouse Electric & Manufacturing Company; Hercules, F. S. Briedenbach, of the Chas. Q. Tyson Company; Mars, C. B. Frankel, of the Dayton Power & Light Company; Apollo, J. C. Matthieu, of the Dayton Power & Light Company; and Avrenim, G. B. Sayre, of the Apple Electric Company. "Imps" were A. B. Weinfeld, of Erner & Hopkins, H. E. Long, of the Wm. Hall Electric Company, R. R. Pleasant, of the Pleasant Electric Company, John Martin, of the Chas. Q. Tyson Company, and Chester Lesher, of the Lesher Electric Company.

Governor Cox, of Ohio, was present during the greater part of the evening, and apparently enjoyed the program very much, expressing himself to that effect. In the social session which followed the initiation, Statesman Thomas F. Kelly, of the Dayton Power & Light Company, acted as toastmaster, introducing as the first speaker Statesman Niesz, of Chicago, who was followed by H. H. Cudmore, of the National Lamp Works, of the G. E. Co., of New York, who was present as a special guest. He spoke on "The Society for Electrical Development," explaining the objects of that organization and benefits of membership in it. A number of the initiates also spoke informally.

Statesman J. W. Schrantz, of the Cincinnati Jovians, was present, and extended a hearty invitation to the Daytonians to attend the Cincinnati rejuvenation on May 18.

Jovian Activities at Columbus.

A gathering of fifty or more Columbus, O., Jovians listened to a fine address by H. C. Lord, professor of astronomy, Ohio State University, on May 15, at the Virginia Hotel. Professor Lord talked on "Astronomy as Applied to Every-Day Life," showing among other things the manner in which time was ascertained by aid of the stars and the results transmitted by wireless telegraphy.

Preliminary arrangements were made at the luncheon for the annual Jovian picnic, to be held at Buckeye Lake in June. This form of outing has prevailed for the past three years and is in growing favor. In addition to the 200 local Jovians, the invitation is extended to all Columbus electrical people and their families. This year for the first time business places will be closed throughout the day, if plans succeed, so that everyone will have a chance to attend. Buckeye Lake is a beautiful little summer resort, lying within an hour's ride of the city by trolley.

It is estimated that about thirty members will attend the Cleveland Electrical Exposition on Jovian Day, May 26, in response to an invitation from the Electrical League of Cleveland. A special car will probably be engaged for the trip.

Meeting of Dayton Jovian League.

About eighty members of the Dayton Jovian League attended the regular monthly dinner of that organization, at the Dayton Club, on Monday evening, May 19, at which A. A. Gray, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, was the principal speaker. Speaking on the subject of "Opportunity," Mr. Gray claimed that those connected with the electrical industry were receiving less remuneration for their product than was the case in any other field, although the comforts and conveniences that electricity brought into the home were greater than any other thing that goes to make up a real home.

Statesman Thomas F. Kelly, sales manager of the Dayton Power & Light Company, announced that the next rejuvenation would be held on Tuesday, September 15.

Louisville Jovians Activities.

The Louisville Jovians will be in the local amateur athletic field this summer with a redoubtable baseball team, if the promises of the leaders of the organization are borne out. Decision to organize was reached recently and the committee is now at work selecting the players and getting the equipment together. The recently announced plans for the weekly midday meetings of the local organization have found such meetings to be impractical, according to Robert Montgomery, temporary chairman. It was found that so few of the members were in position to assemble at a stated midday hour that it was decided, instead, to hold monthly evening meetings. These will probably be held on the second Tuesday of the month, with a dinner at 6:30 o'clock, followed by speeches.

Chicago Jovian League.

Max Zabel, patent attorney of Chicago, was the speaker at the regular meeting of the Chicago Jovian League on Monday, May 18. Mr. Zabel commented briefly on the present patent system and stated that while it was fundamentally correct, the remarkable increase in inventions during recent years has made certain revisions and additions necessary. He spoke of the old provisions which made it necessary to spend large sums of money and a great deal of time to ascertain the validity of a patent in case of litigation. Under the changes recently inaugurated, patent cases can be tried in open court, and much of the expensive testimony which was heretofore necessary can be eliminated. Mr. Zabel spoke particularly of the inadequate facilities of the present patent office building in Washington, and asked for the co-operation of everyone interested in inventions to lend his endeavors for the erection of a suitable building.

Extensive Use of Electric Power in Irrigation Construction.

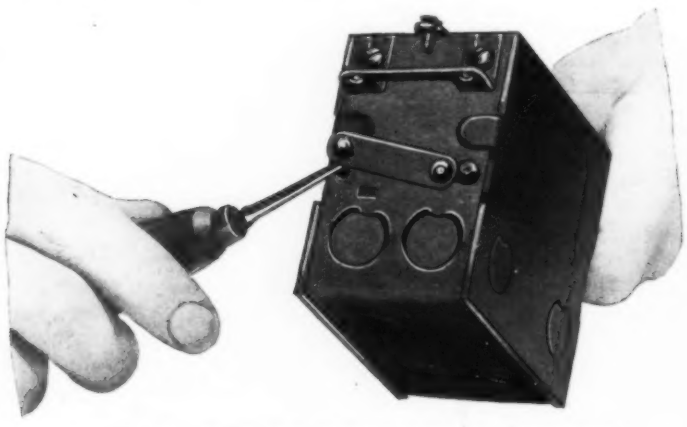
In the construction of the Sun River irrigation project in Montana, electric power is being used on a larger scale than ever before in similar work. In fact, it is stated that this project is the first one of its kind in which electric power is used extensively for operating excavating machinery for canals, drains, tunnels, etc. The Montana Power Company has constructed a special transmission line 75 miles long from the Great Falls of the Missouri River westerly along the entire length of the Sun River project. From this the power is distributed to the contractors over the distribution lines of the United States Reclamation Service. H. N. Savage is supervising engineer for the Service.

New Electrical and Mechanical Appliances

New Pressed-Steel Switch Boxes.

The Chelten Electric Company, 314 Armat Street, Philadelphia, Pa., has designed and is manufacturing a new ingenious pressed-steel wall case for use in connection with mounting push-button switches and receptacles and similar specialties. This box has the marked advantage of being so arranged that it may be ganged to meet the requirements of the contractor. Another decided advantage, which is something entirely new in this line, is the fact that no loose parts or screws are found, as the box can be readily ganged and held together by pins rigidly fastened to the side of the box by means of flat springs. These boxes are made in the deep and shallow types for loom and conduit, and are furnished in black enamel finish.

In using this box the contractor saves a great deal of time. It is not necessary to back the screw out of place, but simply necessary to lift the springs, place the spacer in place, replace the side, and the two-gang box is ready for use. Should larger gang boxes be required, these can be readily made up by means of extra spacers. These new boxes are meeting with general approval, and the Chelten company is distributing samples gratis for trial.



New Chelten Switch Box, Showing Method of Manipulation.

New Battery-Charging Rheostat.

There are many storage-battery-equipped gasoline automobiles which have no protection for properly keeping the batteries automatically charged. This has aroused great interest among garage men and owners, and created a demand for a low-priced, durable battery-charging rheostat.

The Ward Leonard Electric Company, Bronxville, N. Y., which has specialized on dynamo controllers, battery controllers and motor controllers for many years, is placing on the market a rheostat that is 11 inches square by 3.5 inches deep, and will take care of from one to four cells of battery at a charging rate of eight amperes. This is a very inexpensive but serviceable rheostat. The company also builds larger rheostats to take care of higher charging rates. The illustration herewith shows the small rheostat mentioned.

Small Battery-Charging Rheostat.

New Ozone Air-Purifier.

The illustration herewith shows a new type of ozone air-purifier made by the Neel-Armstrong Company, Akron, O. This machine is being used successfully in motion-picture theaters, toilet rooms of public buildings, etc. It is also widely used in the refrigerators of abattoirs and meat markets where it is claimed that a saving in ice is made as well as an improvement in the refrigeration. It is stated, for example, that fish can be kept three times as long with this system as when ice alone is used, and the odors are practically eliminated.

Tests by the city chemists of Akron in the Waldorf Moving Picture Theater show the following results obtained by the installation of one of these machines.

	Examination of Air.		
	Jan. 23, 7 p. m., No Ozone.	Jan. 24, 5 p. m., With Ozone.	Reduct'n in Colonies of Bacteria.
Carbon dioxide, in parts per 10,000	35	30	
Oxygen, per cent	19.4	20.1	
Colonies of bacteria on culture plates:			
10 minutes' exposure	300	17	95%
20 minutes' exposure	Innumerable	80	90% or more

The outfit illustrated is equipped with a Robbins & Myers rotary transformer for converting direct current into alternating current for the transformer which steps the voltage up to the high pressures required for this service. A "Standard" fan, also manufactured by the Robbins & Myers Company, Springfield, O., is mounted within the transformer case to blow the ozone out into the room.

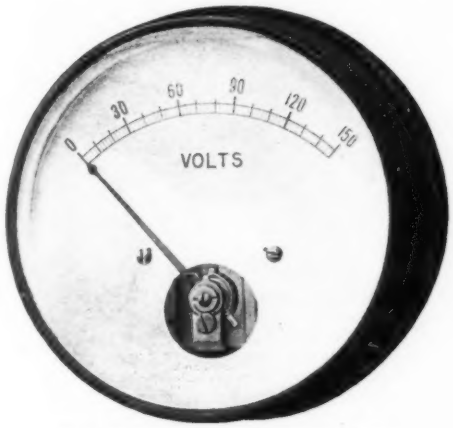
Ozone Air-Purifier.

To eliminate the formation of metallic oxides due to the ozone coming in contact with the metals of the outfit, all wiring is hermetically sealed in

glass tubes. The design is also such as to prevent any heating so there will be no production of nitrous oxides.

New Small Direct-Current Switchboard Ammeters and Voltmeters.

A new line of five-inch direct-current ammeters and voltmeters has just been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. These are indicating meters suitable for small isolated plants, yachts, battery-charging panels, etc., where a high-grade low-priced polarized instrument is required. The meters operate on the D'Arsonval principle, having a moving coil and a permanent magnet. Being of this type, they possess many points of superiority to the moving-iron type construction found in the usual low-priced meters.



New Five-Inch Switchboard Voltmeter.

View of Interior Construction of Instrument.

The complete movement is mounted in the case as a unit. A unique feature is the arrangement of the moving element, which can be taken from the movement by simply removing two screws on the side of the pole-piece support. The entire moving element and bearings can then be lifted out as a unit and can be replaced in exact position. This makes it possible to repair the meter without disturbing the alinement of the magnetic circuit.

Owing to the use of an aluminum pointer, a light counterweight is possible, resulting in a light weight of movement and small wear on the pivot jewels. The high torque, in proportion to the light weight, insures great accuracy considering the size of the instruments.

Their scales are four inches long, practically the same length as the scales of many of the seven-inch meters. The full length of the pointer shows on the dial, thus making the meter as easy to read as a clock. The movement is thoroughly damped to secure dead-beat readings. Although somewhat diminutive in size, these meters are not in any sense competitive with many "toy" meters on the market, but are designed along strictly scientific lines and possess a high grade of quality.

Electric Semaphores to Regulate Street Traffic.

Electric semaphores, the invention of Sergeant Jack Sherry, and Wagon Officer Wallman of the Oakland, Cal., police department, have been installed at the four corners where Twelfth Street and Broadway intersect for the purpose of testing their efficiency in the regulation of street traffic. If the device proves its efficiency it is probable that the semaphores will be installed at all the principal crossings in the city.

Ornamental Post for Gas-Filled Tungsten Lamps.

The development of the gas-filled tungsten-filament lamp has made it possible for many cities to have lighting systems which are not only ornamental, but efficient. Where single-light posts are preferred because of their simple elegance and dignity of design, such a unit as is illustrated herewith will be found very attractive in appearance and highly efficient for lighting the streets and boulevards.

Ornamental Post

The 16-inch globe is made of Alba glass which absorbs only a small percentage of light and yet eliminates glare due to the high intrinsic brilliancy of the filament of these lamps. On account of the high temperature of the lamp, it is necessary to provide ventilation. Air enters through ventilating holes in the globe-holder, passes around the lamp socket and lamp and out through the holes in the top ventilator. These holes are protected with perforated metal which keeps out the bugs which are usually attracted by the light. The ventilator is so designed that light rays in the vertically upward direction are reflected downward, and yet enough light is thrown into the region above the lamp to illuminate the facades of buildings. The greater part of the light is thrown downward, however, where it is required in lighting the sidewalks and streets.

The post is particularly adapted for lighting boulevards, parks and private grounds, entrances to public buildings, etc. The 750-watt or 1,000-watt multiple lamps may be used or any of the large number of street series lamps. Where lamps of 600-candlepower or larger are used, it is generally more economical to mount a compensator in the base of the post with an absolute cutout directly beneath it and operate the 20-ampere gas-filled lamps on a regular 6.6-ampere or 7.5-ampere series street-lighting circuit.

The base of this post is 20 inches in diameter and 2 feet 8 inches high. The column is 7.5 inches in diameter above the base and 6.125 inches in diameter near the top. The height to the center of the 16-inch globe is 13 feet 6 inches, and to top of the ventilator 14 feet 6 inches. The post is made of high-grade cast iron, sharp and true to design. The ornametal post and ventilator are manufactured by the George Cutter Company, South Bend, Ind.

The Connecticut Automatic Igniter System.

As the result of extended experience in the design and manufacture of ignition apparatus for internal-combustion engines, the Connecticut Telephone & Electric Company, Meriden, Conn., has perfected a very simple system of ignition which combines the advantages of both magneto and battery systems

Fig. 1.—Connecticut Igniter Complete.

and eliminates the shortcomings of each. The new Connecticut automatic igniter system operates from a storage battery with or without reserve dry cells, but uses a breaker box of the magneto type and steps up the current by means of a transformer coil just as with a magneto. It can therefore produce a hot, powerful spark at all speeds. The system gives the best results when used with a generator supplying the storage battery for lighting and electric starting.

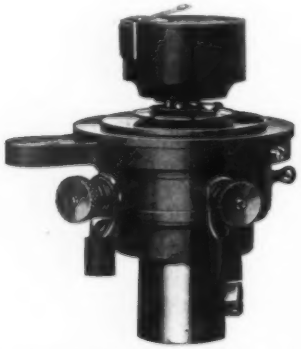


Fig. 2.—Igniter After Removal of Distributor Cap.

A single spark is produced upon a break occurring in the primary circuit which, when closed, has energized the coil. This break is produced in the igniter by means of a cam revolving against a breaker arm, the high-tension spark resulting being distributed to the spark-plug circuits in the same instrument. The igniter is mounted on a vertical shaft running at all times at half of the engine speed, regardless of the number of cylinders the engine may have.

A view of the igniter completely assembled is shown in Fig. 1, which gives a good idea of the compactness of the instrument. Its extreme length is only 4.75 inches and its weight only about 1.5 pounds. All of the equipment can be readily taken apart and reassembled without special tools. On removing the distributor cap the breaker box is better disclosed, as shown in Fig. 2. In Fig. 3 are shown all parts of the instrument disassembled. The contact points are extra heavy and when running on test after the equivalent of 40,000 miles gave good results without cleaning or adjustment. Since the breaker arm is heavily insulated from the base, no ground is needed in the battery circuit and the possibility of the ignition being disturbed by grounds or short-circuits in other circuits of the car, is obviated. The interrupter arm is not affected by centrifugal force, because it is provided with a single insulating roller acting against the cam.

No relay, trigger, cam or other time-

Fig. 3.—Ball-Bearing Igniter Entirely Disassembled.

lagging device is used to effect the primary break, which is produced directly; this avoids time lag on medium or high speeds and makes the device suitable for all speeds. Both the cam and shaft are of polished steel and the igniter is supported on the shaft by means of either ball bearings or special self-lubricating bearings. The distributing arm and the distributor case are made of special insulating composition which is unaffected by heat or moisture. A dustproof and oilproof partition separates the high-tension and low-tension parts of the equipment.

In Fig. 4 is shown the new combined coil and switch with cover removed to show the terminal connections. This coil is built to the same high standard that has long characterized the company's coil equipment. The casing of the coil is made of a heatproof insulating material of high dielectric strength. The windings are thoroughly insulated to withstand a voltage greatly exceeding that to which they are likely to be subjected. The entire interior construction is such that the coil remains rigid and the internal connections tight. The cover keeps the outside connections well protected. In the cover is a window for observing the spark gap that is provided in all coils to protect the high-tension winding from rupture if the spark-plug terminals should become

Fig. 4.—Combined Coil and Switch, Cover Removed.

disconnected. This spark gap is arranged in a glass tube so as to be visible and to guard it from explosive vapor. The coil shown in Fig. 4 has combined with it an automatic switch. In another construction this switch is separate.

Fig. 5 shows the front view of this switch. Three generous-sized push-buttons are provided. The buttons *B*

Fig. 5.—Front View of Automatic Switch.

and *M* are for the reserve battery and magneto, if one is used, or for the reserve dry battery and the main (storage) battery. In connection with the *off* button is an arrangement thermostatically controlled to open the primary circuit automatically if the car

is left standing with the engine not running but the switch still *on*; this also opens the circuit like an overload circuit-breaker, if an excess current should be thrown onto the ignition circuit. Thus in each case it protects the battery from wasteful drain. The circuit is closed in the automatic switch through heavy and positive contacts of the plunger type. These plungers are held in contact by a slotted locking plate, which is released by the *off* button on the switch, or in cases of prolonged or excessive flow of current, as mentioned above, by a vibrating magnetic release thermostatically effected. The construction is such that no amount of outside vibration or jar can affect the locking plate.

Demagnetizing Cutting Tools.

One of our British contemporaries states that magnetic grippers and chucks were first adopted for grinding machinery, and found adoption afterwards on lathes. Their use, however, involves the difficulty that the cutting tool itself becomes magnetic, and that the turning and chips stick to the tool, especially when the speed of working is not high. The neatness of the work suffers under this drawback.

The Magnetwerk, of Eisenach, in Thuringia, Germany is therefore introducing a demagnetizing coil which is pushed over the upper part of the cutting tool and fed with alternating current.

New Pull-Switch Rosettes.

The firm of Pass & Seymour, Incorporated, Solvay, N. Y., has added to its already extensive assortment of electrical fittings a new line of pull-switch rosettes embodying the Fluto interchangeable feature. The general design and construction of these rosettes as well as their valuable interchange feature are well made clear in the accompanying illustrations. It will be observed that these rosettes can be adapted to a great variety of bases, so that they may be used on cleat work, on standard outlet-box work, on ordinary concealed wiring, as well as for special fittings such as Taplets, Adapti boxes, Condulets and other fittings.

Group of New Pull-Switch Rosettes With Various Bases.

These rosettes are all supplied with a short chain, to which is added 10 feet of black linen cord and black acorn. This permits of the use of a pulley or eyelet, through which the cord may be passed for distant control.

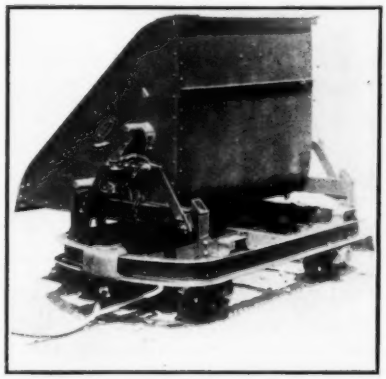
The electric light and power building at Washington Park, N. J., an amusement park near Philadelphia, was destroyed by fire early on the evening of May 11, causing a loss of $30,000.

A New Part-Way Dump Car for Handling Coal to Boilers.

The Bertha Mining Company recently purchased an interesting special type of dump car for handling coal to its boilers, the car only dumping part way and remaining in position so that the material could be shoveled out easily and rapidly. When loading, the car remains in normal upright position, but when unloading it is tipped over to the position shown in the illustration and held by an adjustable calk which fits under the rockers.

The car was designed for running over the floor and is provided with flangeless wheels and swivel front axle with handle so that it can be pulled in any direction. The car was designed and manufactured by the Orenstein-Arthur Koppel Company, of Koppel, Pa., and the underframe is made with that company's special wide flange channel and roller bearing.

Use of this type of car is peculiarly valuable in hand-fired boiler plants where accurate record is kept of weight of coal burned or where it is desired to keep the floor clear of coal piles. It also reduces the amount of extra handling of coal with its waste labor and dust and dirt. When a test is being made of a plant, this type of car will be found practically indispensable.



Part-Way Dump Coal Car.

Baltimore's Large Railway-Motor Order.

The United Railways & Electric Company, Baltimore, Md., has awarded the General Electric Company the contract for the 85 four-motor equipments which will be installed on the new cars being built by the J. G. Brill Company. The cars are the double-end type, and improved K35-U2 platform cylinder-type controllers are included in the installation. The motors selected are GE200 split-frame commutating-pole positive-ventilated type, having a nominal rating of 33 horsepower on 500 volts and 40 horsepower on 600

volts, and a gear ratio of 69/14. It is interesting to note that this additional traction equipment has been purchased primarily to provide adequate service during the centennial celebration of the writing of "The Star Spangled Banner," which occurs in Baltimore during the week of September 7.

The contract also includes additional substation apparatus, comprising a 2,000-kilowatt 25-cycle six-phase compound-wound rotary converter; three 750-kilowatt transformers, and switchboard panels.

Oil Fuse Cutouts for High-Tension Circuits.

A new type of oil fuse for circuits up to 2,500 volts has been developed

Fig. 1.—D & W Oil Fuse Cutout.

and placed on the market by the D & W Fuse Company, Providence, R. I. These fuses have been designed after careful study of the requirements of such devices and have been perfected to the point where it is believed they overcome all defects in devices of this type heretofore employed. It is known that the oil-break fuse possesses marked advantages over other types of primary cutouts. The crude design of

Fig. 2.—View Showing Construction of Fuse Carrier.

such devices heretofore used, however, has rendered their operation unsatisfactory.

In the new D & W oil cutouts the fuse element is placed under a heavy mass of special oil. When the fuse is blown the terminals are forcibly thrown apart and the oil between them completely prevents the formation of an arc. The device has a venting system to prevent the accumulation of pressure within the casing and also to prevent blowing out any oil. At the bottom of the oil container is a plug outlet, by means of which the oil can be drawn off. This is seldom necessary, however, since under ordinary service conditions the oil does not require renewal more than once in one or two years. A filter can be furnished for readily removing carbon or other impurities from the oil when it is withdrawn. Flexible cable terminals are provided, as shown in Fig. 1, which illustrates the cutout complete.

Three sizes of these have now been developed suitable for currents of 50, 100 and 200 amperes. In each case the fuse link is made from a special alloy having low melting point and high conductivity; this prevents excessive rise in temperature of the oil and thereby makes carbonization of the oil practically negligible. The design of

Fig. 3.—Replacing Fuse Carrier.

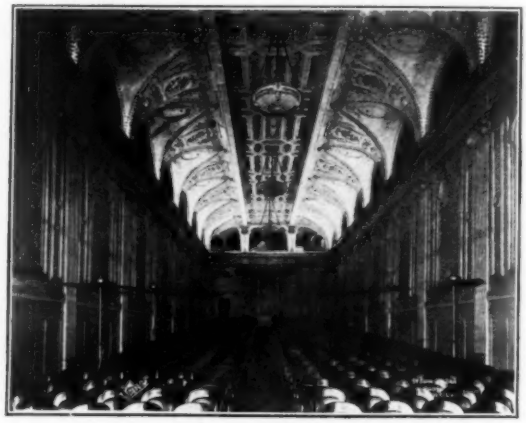
these fuses is liberal, so that a safe operating value of 10 times full load can be handled on short-circuit. Even above this is an ample factor of safety, so that in actual commercial service these cutouts have been found to meet all conditions.

In Fig. 3 is shown the method of replacing the fuse carrier in the casing. The design has been made such that this is rendered perfectly safe for the operator. A new fuse can be inserted even while the line is short-circuited without risk to the lineman. This safeguard is obtained through an arrangement by which automatic locking of the cover takes place before contact is made with the fuse terminals. Thus the entire device is effectively locked against the blowing out of the fuse carrier and oil, if an unexpected blowing of the fuse should take place upon renewal of the element. The locking arrangement is made clear from the illustration herewith. In Fig. 2 the construction of the entire fuse carrier is shown.

Cove Lighting for a New Orleans Theater.

Not very long ago an elaborate system of direct lighting was installed at the Trianon Theater, New Orleans, La., but it was soon apparent that in order to show up the interior architecture and decorations to advantage it would be necessary to abolish this system, with its brilliant glare and deep shadows, and install in its place a system which would diffuse a powerful yet soft light over the entire area to be illuminated.

After a careful examination of the various systems now in use, the owners of the Trianon decided that their requirements were most satisfactorily met by the Frink and J-M cove system of indirect lighting. This system consists of lamps set in specially designed Frink reflectors, placed in the coves



Cove Lighting in Trianon Theater.

behind the cornice. In this way large auditoriums are perfectly lighted without a lamp being visible. A powerful light is thrown on the ceiling, and from the ceiling is reflected into the theater.

The best results are obtained by the use of J-M Linolite lamps in connection with Frink reflectors. These lamps are tubular in form, measuring about one foot in length by one inch in diameter. On account of this small diameter they can be concealed in a much shallower cove than would be required by ordinary bulb lamps. When joined end to end, J-M Linolite lamps produce a continuous "line of light" which eliminates the "spotty" effect caused by standard bulbs.

The relighting of the Trianon Theater has brought forth many favorable comments from those who have had an opportunity to see both the direct and indirect systems.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—Metropolitan Engineering Company, 1238-1252 Atlantic Avenue, Brooklyn, N. Y.

Steel cabinets, Cat. No. 952, with sheet-metal meter adapters for inclosing the connections to meters.

Wire conduit connectors for use with the above cabinet, Cat. Nos. 9250-9259 inclusive, four inches to 10 inches long.

Approved April 14, 1914.

CINEMATOGRAPH PROJECTOR.—Compagnie Generale d'Establishments Pathe Freres, Vincennes, France, for Pathescope Company of America, 141 West Thirtieth Street, New York, N. Y.

"Pathescope" portable self-contained motion-picture machine, deriving power for the incandescent-lamp illuminating element from a small permanent-magnet generator belt-driven from the film-operating mechanism. A special slow-burning film is supplied for use with this equipment.

Approved April 30, 1914.

CONDUIT BOXES, Floor Outlet.—Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York, N. Y.

Catalog No. 6860, non-adjustable.

"P. R.," "Adjustable" and "Adjustable-Self-Leveling" watertight floor outlet boxes. Catalog Nos. 76470, 76459-60, 75939-40. Catalog No. 6860, non-adjustable.

Approved April 18, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Everhard Manufacturing Company, Canton, O.

"Diamond E" service ell, .5-inch size.

The cast-iron fitting consists of a conduit ell having a pipe-like projection with an oblong opening facing downward near the end, the opening being closed by a porcelain insulating bushing with two outlet holes. The device is designed for installing on the outside of a building, to which it may be secured by two screws.

Approved April 14, 1914.

FLEXIBLE CORD.—Kerite Insulated Wire & Cable Company, 30 Church Street, New York, N. Y.

Marking: Green, white and black threads parallel with wire between rubber insulation and braid.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved April 6, 1914.

FLEXIBLE CORD, Portable, For Electric Heaters.—Northern Electric Company, Limited, Montreal, Canada.

Multiple-conductor cords composed of loosely twisted wires with cotton wind, rubber and asbestos insulation covered with an open retaining braid and assembled as a twisted pair with an outside protecting braid over the whole.

Marking: Yellow thread woven in braid, or, one blue, green or black thread in a red braid.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved April 18, 1914.

INCUBATORS AND BROODERS, Electrically Heated.—Electric Manufacturing Company, 926 LaFayette Street, New Orleans, La.

"Reed's" electric incubator and brooder.

Electrically heated incubators and brooders shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved March 26, 1914.

PAPER LIFT.—H. B. Rouse & Company, 2214 Ward Street, Chicago, Ill.

"Rouse" paper lift, consisting of a three-quarter horsepower, 220-volt, direct-current series motor geared to hoisting cables for attachment to trucks for lifting paper to feed boards of printing presses. Motor protected by fuses inclosed in cast-iron cabinet and controlled by an enclosed triple-pole, double-throw knife switch. Safety stops are provided which mechanically open the switch to prevent over-travel.

Approved April 30, 1914.

RECTIFIER. — Wagner Electric Manufacturing Company, 6400 Plymouth Avenue, St. Louis, Mo.

Vibrating rectifiers for use on 110-volt, alternating-current circuits for charging 6, 8 and 10-volt lead storage batteries.

Types 5-B, 7½-B, 10-B and 15-B.

Approved April 20, 1914.

ROSETTES, Fuseless. — Harvey Hubbell, incorporated, Bridgeport, Conn.

Ceiling pull-switch rosettes, Catalog Nos. 5900, 590, 5905, 5906, 5942, 5943, 5950, 6029, 6031; with "Economy" extender, Catalog Nos. 5920, 5921, 5925, 5926, 5944, 5945, 5951, 5952, 6032, 6033 and 6034.

Approved April 18, 1914.

SIGNS, Electric.—Halpern Brothers. 218 West Twentieth Street, New York, N. Y.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached to each sign.

Approved April 23, 1914.

SOCKETS, Standard.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" porcelain-shell sockets.

Keyless, 1,500-watt, 600-volt, mogul base; catalog Nos. 4062, 4069-71.

Approved April 24, 1914.

SOCKETS, Standard.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

C-H, 660-watt, 250-volt.

Brass shell.

Push button, catalog Nos. 7500, 7506.

Keyless, catalog Nos. 7501, 7507, 7511.

Porcelain shell.

Push button, catalog No. 7401.

Approved April 18, 1914.

SWITCHES, Automatic. — General Electric Company, Schenectady, N. Y.

G. E. control switches.

Type CR-2391 (direct current) single-pole contactor, 50-1,800 amperes, 115,-320 and 550-volt.

Type CR-2392 (alternating current) single-pole and multiple contactors, 50-1,800 amperes, 115, 230 and 550-volt.

Approved April 18, 1914.

SWITCHES, Automatic. — General Electric Company, Schenectady, N. Y.

Types CR-2930, 2931 float switches for use with automatic motor starters of electrically driven hydraulic pumps, 5-25 amperes, 110, 220 and 550-volt.

Type CR-2920 pressure governors for self-starting motor-driven pumps, 3-50 amperes, 110, 220, 440 and 550-volt.

This approval is not to be construed as an approval of the devices for use in connection with automatic sprinkler or similar fire-protective equipments for which services their merits have not been investigated.

Approved April 20, 1914.

SWITCHES, Knife.—A. G. Electric & Manufacturing Company, P. O. Box 406, Seattle, Wash.

Motor-starting switch, 30-ampere, 250-volt, direct and alternating current.

Approved March 18, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

WATERBURY, VT.—Pursuant to a vote taken at the March meeting the committee selected for the purpose of investigating electrical powers has appointed F. O. Sinclair, of Burlington, who was formerly advising civil engineer for the Public Service Commission, to investigate the proposition of a municipal electric light and power plant. It is the purpose of the town to furnish lighting for its streets, residences and power for such industries as want it in the town. The committee, in charge of the matter, are William Clark, V. L. Perkins and Fred Luce.

EAST NORWALK, CONN.—An appropriation of $25,000 has been made for the construction of a new lighting plant here. Address Arthur Waldron.

NIAGARA FALLS, N. Y.—The Board of Public Works has approved the plan of extending the ornamental lighting system on Main Street to Falls Street, at a cost of $20,000. Address M. J. Donohue, city electrician.

HAMBURG, N. J.—The Township Committee is considering the establishment of a lighting system for the streets of Hamburg. A.

JOHNSONBURG, N. J.—Residents of Frelinghuysen Township are arranging for the construction of a telephone system between Johnsonburg and Marksboro. A.

PRINCETON, N. J.—The Public Service Electric Company will install underground lines in Nassau Street, Prospect Avenue and Washington Street. A.

BUTLER, PA.—The Butler Light, Heat & Motor Company was awarded the contract for lighting the streets of Butler at a meeting of the City Council last week. An effort was made for a time to have gas lights used and to eliminate a number of the electric lamps, but this was voted down at the meeting. Cluster lights will be used in the business section of the town.

HOLTWOOD, PA.—The Pennsylvania Water & Power Company is planning a new transmission line to be erected between the Holtwood plant and Baltimore, Md., which will take care of the increasing business in the latter city. At the present time the demand for power in Baltimore is greater than the capacity of the line, and much power is wasted by overloading the line. The work will cost about $400,000.

SOUTH ATLANTIC STATES.

WARSAW, N. C.—The Atlantic & Carolina Railway Company has been incorporated to construct and operate an interurban electric railway from Warsaw to Kenansville, about 10 miles. The incorporators are T. A. Hefty, Bowden, L. A. Beasley and H. D. Williams, Kenansville.

NORTH CENTRAL STATES.

BARBERTON, O.—The $20,000 bond issue for electric-light purposes has been disposed of at a premium, and the town will proceed to make arrangements for the construction of a municipal plant. Contracts have not yet been let. L.

BRADFORD, O.—This town has sold an issue of $2,000 electric-light bonds, with the proceeds of which a small plant will be constructed. L.

LEBANON, O.—The plant and other property of the Loveland Electric, Ice & Water Company will be sold by the receiver, under orders of the Court, at Lebanon, on June 6. The assets of the company are appraised at $75,000. L.

ELKHART, IND.—The Elkhart Manufacturers' Association is planning to construct a $50,000 electric-power plant here.

RICHMOND, IND.—The city will shortly buy 350 street lamps, type not decided upon. C. A. Kleinknecht is the superintendent of the lighting plant. G.

EAST CHICAGO, IND.—The Northern Indiana Gas & Electric Company has been given authority by the Public Service Commission to issue $1,020,000 bonds and $282,000 gold notes for the construction of its new plant at East Chicago.

ROCK FALLS, ILL.—The Illinois Northern Utilities Company has purchased of Mr. Paul Dillon his electric power franchise in Rock Falls,, and it is expected that the transmission lines into Rock Falls will be rebuilt immediately.

SPRINGFIELD, ILL.—Residents of West Grand Place, an outlying residence section of Springfield, have organized the West Grand Improvement Association and appointed a committee to investigate the feasibility of erecting an independent lighting system. Dr. W. G. Bain is president of the Association, William Price, secretary. Inability to get a satisfactory arrangement with the Springfield Utilities Company is the reason for this decision.

SPRINGFIELD, ILL.—The City Commissioners have ordered the installation of a lighting system in Adams Street for a distance of twelve blocks. The new nitrogen lamp will be tried first. If they do not prove satisfactory they will be replaced with others. Z.

ALBION, MICH.—The Commonwealth Power company will install a complete new tungsten lighting system here.

ISHPEMING, MICH.—The Council will place additional boulevard lights. Address the village engineer for general information.

MANITOWOC, WIS.—It is estimated that improvements and a new building for the municipal lighting and power plant will cost the city $60,000.

NEW RICHMOND, WIS.—The Wells Electric Construction Company has been organized here, and will construct an electric lighting plant at New Richmond. P. F. Neverman is president.

ALLISON, IOWA.—The election on the proposed franchise asked by the Hampton Electric Company resulted in a unanimous vote in favor of the proposal of the company to furnish electricity to this town. The franchise runs for 25 years and the Hampton company will build a transmission line to this place.

HIBBINGER, MINN.—The Water and Light Board is considering ways and means of building a lighting plant. Address W. J. Ryder for desired information.

LAMBERTON, MINN.—A franchise has been granted for the construction of an electric light plant. Address Fred Griffin.

NEW YORK MILLS, MINN.—Instead of purchasing gas lights the Council will have an electric light plant installed. The contract will be awarded to the lowest bidder for installing the plant. C.

ST. PAUL, MINN.—The Consumers Power Company will soon build a high-tension transmission line 33 miles long from St. Paul to near Northfield, Minn., to connect the hydroelectric transmission systems of the Faribault and Mankato divisions. This line will open a number of new rural markets of electric service and with its building five hydroelectric plants with 36,500 horsepower and six steam stations with 29,500 horsepower, or a total of 66,000 horsepower, will be connected.

EARLVILLE, IOWA.—An electric light plant will be established here. Address H. J. Vanfleet, mayor, for further information.

MUSCATINE, IOWA.—More than $30,000 will be expended by the Muscatine Lighting Company, in electric-wire extensions in this city. Address Local Manager Carson for particulars.

WAUCOMA, IOWA.—The second election on the question of erecting and maintaining an electric-light plant and issuing $12,000 bonds for the erection and maintenance of such a plant, carried by a large majority.

CHURCHS FERRY, N. D.—The Commercial Club has taken up the matter of securing electric lighting for the town. C.

BROOKINGS, S. D.—Brookings will make extensive improvements to its municipal power and heating plant to the extent of about $10,000. Address the city clerk.

VALLEY FALLS, KANS.—Improvements are to be made to the electric light plant here, the City Council having adopted resolutions to that effect at a recent meeting. New engines and generators are among the equipment to be purchased. M.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—Business men with establishments in the central part of the business district have concluded arrangements for the institution of a "White Way." Eighty-eight high-power lamps will be used in a section now depending for street illumination on 18 arc lamps of the familiar type. The merchants will pay for the installation of the system and the city will be asked to keep it in operation. G.

WICKLIFFE, KY.—Stock has been subscribed, it is given out here, for the installation of a Home telephone exchange here. G.

ASHFORD, ALA.—An election will be held June 8 to decide the question of issuing $10,000 in bonds for establishing an electric-light plant. Address J. S. Radney, mayor, for further information.

ARDMORE, OKLA.—Chicago interests have taken over the Ardmore electric street railway lines under the name of the Ardmore Electric Railway Company and will make numerous improvements and extensions to the system. George S. Cravens is president of the company. D.

BUFFALO, TEX.—A 25-year franchise for an electric-light plant has been granted to Andrew J. Holmes, of Carthage, Tex. The plant is to be installed by July 1.

GAINESVILLE, TEX.—The Texas Light & Power Company will begin work at once on a large power plant in this city, costing $50,000, which will furnish current for local consumption and for interurban lines of North Texas.

SAN ANTONIO, TEX.—A 15-mile road will be constructed by the San Antonio, San Jose & Medina Interurban Railway Company, incorporated for $100,000. The road will run between San Jose and Kirk. The company headquarters, however, will be maintained at San Antonio, Tex. M.

WESTERN STATES.

COLORADO SPRINGS, COLO.—The City Council has under consideration the proposition of installing a municipal electric lighting plant. Bonds in the sum of $150,000.00 were voted for this purpose in 1907, but no action has been taken up to the present time.

PITKIN, COLO.—T. R. L. Dougherty and C. R. Calhoun, of Florida, have made a preliminary survey for the hyroelectric power plant for the Brant Independent Mining Company, and active work will begin on same at as early date as possible.

GREEN RIVER, UTAH.—A special election will be called in the near future to vote on the issuance of bonds for the purpose of erecting an electric lighting plant and distribution system. Information in regard to the same may be had by addressing the town clerk. V.

RENO, NEV.—The Beaver River Power & Plant Company has filed articles of incorporation with a capital stock of $100,000. The directors are H. R. Waldo, George F. Halliday, O. P. McBiersach, E. P. Bacon and H. V. Hoyt.

FLORENCE, ARIZ.—The City Council has instructed the City Engineer to investigate what legal steps are necessary for the city to proceed to raise the money and to install a municipal electric lighting plant. V.

LEAVENWORTH, WASH.—The Cashmere Electric & Water Company recently petitioned the City Council for a franchise for distributing electric current in this city. The Company has already made application for franchises in Cashmere and Wenatchee, and has filed an application with the County Commissioners for the right to set poles on country roads between this city and Wenatchee. The Cashmere company, which was organized several months ago, is planning to build a hydroelectric plant near Cashmere, which will develop enough power to supply the whole Wenatchee Valley. Sufficient capital has been raised to secure its completion. O.

NORTH YAKIMA, WASH.—The Central Heating Company recently petitioned the City Council for a franchise for an electric light and power business, in addition to heating, and has announced the intention of entering into competition with the Pacific Power & Light Company. If the franchise is granted, the company proposes to erect a $100,000 plant. O.

ANDREWS, ORE.—Plans have been completed and surveys made for the construction of a hydroelectric power plant on Wild Horse Creek. Address Jean Bart Balcomb, Andrews, engineer, for further information.

SALEM, ORE.—U. G. Hayne, of Portland, recently filed an application with State Engineer Lewis for a permit to build a 10,000-acre foot storage reservoir on Parmelia Lake, to be used for the development of 26,136 horsepower. Mr. Hayne also proposes to use the water of Marion River, Minto Creek, Parmelia Creek and White Water Creek. O.

LOS ANGELES, CAL.—At the bond election held here May 8, the $6,500,000 bond issue, the proceeds of which are to be used for the purpose of completing aqueduct power plant No. 1, and constructing or acquiring a distribution system in this city, carried by a large margin.

PORTOLA, CAL.—The supervisors of Plumas County have granted a franchise to R. B. Young, of Loyalton, to construct and operate an electric lighting system for the town of Portola. Light, heat and power will be furnished to the residents of Portola and vicinity.

RICHMOND, CAL.—Articles of incorporation have been filed of the San Francisco Northern Railway Company, with a capital stock of $2,500,000, by Allen L. Kittle, Archibald Borland, Frank A. Brush, William L. P. Jackson and John C. Kittle. The purpose of the corporation is to construct a road 42 miles long.

TULARE, CAL.—The Railroad Commission has granted authority to the Mt. Whitney Power & Electric Company to issue $500,000 of its five-per-cent 50-year-bonds. The funds to be received from the sale of the bonds will be applied to the completion of the Wolverton dam, the constructions of distribution lines in substations and other physical improvements. Several new substations will be constructed at various places.

PROPOSALS.

ELECTRICAL EQUIPMENT.—Bids will be received until May 26 for furnishing f. o. b. cars, one 100-kilowatt, 2,300-volt engine-type, two-phase alternator, direct connected to suitable engine. Address F. J. Weisser, city Clerk, Melrose, Minn.

CABLE AND ARC LAMPS.—Sealed proposals will be received until May 28 by John D. Kelly, city secretary, Galveston, Tex., for furnishing ornamental posts and ornamental arc lamps, and 12,000 feet of cable, all in accordance with specifications on file in the office of the city secretary.

ELECTRIC WIRING SYSTEM.—Sealed proposals will be received until May 25 by Mayor Joseph G. Armstrong, Pittsburgh, Pa., for an electric wiring system and other work in the new Market House, Diamond Square. Bids should be addressed to Bureau of City Property, Department of Public Works.

ELECTRIC WIRING AND FIXTURES.—Sealed proposals will be received at the office of the Depot Quartermaster, El Paso, Tex., until June 3 for the electric wiring and lighting fixtures for the officers' quarters, Fort Bliss, Tex. Application for plans, etc., should be accompanied by a certified check in the amount of $10.

ELECTRIC WIRE AND ELECTROLIERS.—Sealed bids will be received until June 1 by John F. Murphy, city clerk, Great Falls, Mont., for approximately 41 one-lamp electroliers, approximately eight three-lamp electroliers, approximately 7,175 feet of conduit and approximately 22,000 feet of wire for the lighting system.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the office of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 2 for furnishing 15,500 feet of galvanized two-inch steel conduit, as per Schedule 6794, for delivery at the Navy Yard, Brooklyn, N. Y.; and until June 6 for furnishing 2,840 batteries, 7 by 1.75 inches, and 1,440 flash-lights without batteries, for delivery at various navy yards, both as per Schedule 6793.

NEW INCORPORATIONS.

BROOKLYN, N. Y.—Universal Sign & Letter Company, Incorporated, has filed articles of incorporation, capitalized at $50,000. The incorporators of the company are Henry A. Jourdan, Ernest Breuer, and Lewis Cohen, Brooklyn, N. Y.

VERNON, N. Y.—Tyler Light & Power Company, Incorporated, has been granted articles of incorporation with a capital stock of $500. The incorporators are Mary E. Tyler, George C. Capes and Edwin E. Morris, all of Vernon, N. Y.

NEW YORK, N. Y.—The Pisch Electric Sign Company, Incorporated, has been granted articles of incorporation with a capital stock of $15,000. The incorporators are Edwin C. Colwell, R. J. Nutting and Frank Pisch, all of New York City.

ROCK ISLAND, ILL.—The Victor Lead Storage Battery Company, capitalized at $100,000, has been incorporated by E. E. Winters, Gus E. Brown and Walter E. Snider, to manufacture and deal in storage batteries. Z.

FINANCIAL NOTES.

A special meeting of the American Gas & Electric Company, to be held on June 3, is to authorize an increase of $500,000 in common stock, to be offered to stockholders at par, or $50 a share.

At the first annual meeting of the Directors of the Western Power Company F. Lothrop Ames was elected president. Irving W. Bonbright was made a member of the executive committee and all other officers were re-elected.

Directors of the American Water Works & Electric Company have elected the following officers: H. Hobart Porter, president; Stuart H. Patterson, vice-president and treasurer; J. H. Purdy, assistant to president; Harry E. Towle, secretary.

The Delta Electric Light, Power & Manufacturing Company and the Greenville Street Railway Company have been consolidated as the Delta Light & Traction Company. F. N. Robertshaw is president and Ralph B. Claggett secretary, treasurer and general manager.

The $6,860,000 Georgia Railway & Power first-refunding-mortgage five-per-cent forty-year sinking-fund gold bonds, recently purchased by Drexel & Company, of Philadelphia, are being offered at 92.5 and interest in Chicago by Kennett, Cowan & Company, as Western members of the syndicate. The bonds are also being offered in New York by Kissel, Kinnicut & Company and in Boston by E. H. Rollins & Sons.

The Ohio Service Company has arranged to purchase the elcetric light and power companies in New Philadelphia, Canal Dover, Cambridge and Circleville, and applications have been filed by the prospective purchaser and the sellers with the State Public Utilities Commission asking authority to close the deals. At Canal Dover and New Philadelphia, the price is $694,000, at Cambridge $750,000, and at Circleville $45,000.

The Bangor Railway & Electric Company will expend this year for extensions and improvements in lighting, power and car lines $191,000, of which $43,000 will be devoted to reconstruction work in Bangor, $28,500 for new water wheels and generators at the Veazie power station, and $37,000 in extending the lines of the Bar Harbor & Union River Power Company, a subsidiary concern in Hancock County. The light and power wires are being extended from Ellsworth to Bluehill, a distance of twenty miles.

The California Railroad Commission has authorized the Mount Whitney Power & Electric Company to issue $500,000 six-per-cent 30-year bonds at 95, the funds derived from their sale to be invested in the completion of the Wolverton dam, the construction of transmission and distributing lines and improvements on the hydroelectric properties. The largest items of expenditure will be $112,135 on the Wolverton dam and $75,000 for completion of the Kaweak generating station.

Control of the Southern Indiana Power Company, which was organized in 1911 as successor to the Bedford Power Company, has passed to a syndicate headed by Chester P. Wilson, of Indianapolis. The company supplies electric power and light to towns and industries in Southern Indiana. It has $800,000 capital stock and $770,000 six-per-cent bonds and operates a combined steam and hydroelectric station on the White River at Williams, with 5,000 horsepower hydroelectric and 5,000 horsepower steam generating capacity.

The $2,000,000 first and refunding five-per-cent bonds sold by the Scranton & Wilkes-Barre Traction Company to Harris, Forbes & Company and Perry, Coffin & Burr are secured by the deposit of $5,000,000 first-mortgage bonds of the Lackawanna & Wyoming Valley Railroad Company and of $1,848,750 of the $1,850,000 capital stock of this company and through these are a first lien on the entire operating property, subject only to prior liens of $880,000 underlying bonds.

At the annual meeting of Western Canada Power Company former directors were re-elected and C. H. Cahan was elected president. President Cahan reported that earnings of the company had increased from $74,420 gross for the year ended December 31, 1912, to $286,210 for the year ended December 31, 1913, while the surplus of the company had increased from $14,804 for 1912 to $200,320 for 1913. It was stated that revenue from power is showing a steady increase, as with improving industrial conditions in British Columbia larger amounts of current are being used.

Arthur D. Lord, president of the Atlantic Gas & Electric Company, has issued a letter to shareholders covering operations of the company for the first quarter of the present year. In it he says: "The larger amount of investment made by subsidiary and affiliated companies of the Atlantic Company is being made for improvements to properties in the Easton, Pa., district, which work is now nearing completion. A new 6,333-horsepower turbo-generator was put into service early in January, and the work of installing a second 6,333-horsepower turbo-generator is being rapidly pushed. The generating capacity of the plant at present, without taking into consideration the new generator being installed, is 10 000 horsepower. The new station building at Boonton, N. J., has been completed and two 1,000-horsepower turbo-generators are now being installed. Announcement has been made by the Bethlehem Steel Company that in the next three years $25,000,000 will be spent in the Bethlehem-Easton section of the Lehigh Valley to meet the rapidly expanding manufacturing conditions."

Dividends.

	Term.	Rate.	Payable.
Am. Pow. & Lt.	Q	1 %	June 1
Am. Rys. com.	Q	1.5%	June 15
Atl. Gas & Elec. pf.	Q	1.5%	May 15
Blackstone Val. Gas & Elec. pf.	S-A	$3.00	June 1
Blackstone Val. Gas & Elec. com.	Q	$2.00	June 1
Cent. Miss. Val. Elec. pf.	Q	$1.50	June 1
Colo. Pow. pf.	Q	1.75%	June 15
Conn. Riv. Pow. pf.	S-A	3 %	June 1
Norf. Ry. & Lt.	S-A	3 %	June 10
Ontario Pow.	Q	1.25%	June 1
Pensacola Elec. pf.	S-A	$3.00	June 1
Phila. Elec.	Q	1.75%	June 1
So'west Pow. & Lt. pf.	Q	1.15%	June 1

Reports of Earnings.

CONSUMERS POWER OF MICHIGAN.

Consumers Power Company of Michigan reports as follows on April, 1914, and the twelve months ended April 30:

	April	12 Months
Gross earnings	$279,085	$3,241,643
Net earnings	199,013	1,862,786
Surplus after charges	105,429	793,299
Balance after preferred dividends	77,929	463,299

STANDARD GAS & ELECTRIC.

Combined earnings of operating subsidiaries of Standard Gas & Electric Co. for year ended February 28, 1914, were:

	1914	1913
Gross earnings	$14,077,589	$13,365,914
Net after taxes	6,372,505	6,078,062

MONTANA POWER COMPANY.

The Montana Power Company reports for three months ended March 31:

	1914	1913
Gross earnings	$977,666	$875,095
Net after taxes	697,378	608,062
Surplus after charges	449,253	383,549

NEW ENGLAND POWER COMPANY

	1914	1913
April gross	$85,428	$54,507
Net after taxes	54,486	35,836
Surplus after charges	25,217	13,754
Balance after accrued dividends	4,667	3,505

NIAGARA FALLS POWER COMPANY

The Niagara Falls Power Company has issued its report for the year ended December 31, 1913. The combined income account of the Niagara Falls Power Company and Canadian Niagara Power Company compares as follows:

	1913	1912
Gross earnings	$2,742,192	$2,497,196
Operating expenses	440,265	365,097
Reserve*	100,000	100,000
Net earnings	2,201,927	2,032,099
Total income	2,317,986	2,180,662
Charges, taxes, etc.	1,247,876	1,252,805
Surplus	*1,070,110	927,858
Dividends	460,616	460,616
Surplus	609,494	467,242

*Equal to 18.58 per cent on $5,757,000 capital stock, against 16.10 per cent earned on same stock previous year.

CUMBERLAND COUNTY POWER & LIGHT

	1914	1913
March gross	$ 182,628	$ 171,116
Net after taxes	62,874	67,966
Surplus after charges	*669	11,158
12 months' gross	2,388,970	2,178,838
Net after taxes	1,021,309	963,973
Surplus after charges	286,707	302,365
Balance after preferred dividends	†148,707	204,365

*Deficit. †Equivalent to 5.5 per cent on common stock.

COLUMBUS RAILWAY, POWER & LIGHT.

	Mar. 1914	3 Months
Gross earnings	$250,185	$768,751
Net after taxes	89,934	282,494
Balance after interest	47,025	141,925
Surplus after preferred dividends	26,680	90,890

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WTH THE PREVIOUS WEEK.

	May 18	May 11
American Tel. & Tel. (New York)	128¼	122
Commonwealth Edison (Chicago)	134½	134½
Edison Electric Illuminating (Boston)	251	247
Electric Storage Battery, common (Philadelphia)	52¾	52
Electric Storage Battery, preferred (Philadelphia)	52¾	52
General Electric (New York)	138	145½
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric, common (Boston)	11	10
Massachusetts Electric, preferred stamped (Boston)	61	58
National Carbon, common (Chicago)	108	108
National Carbon, preferred (Chicago)	118	118
New England Telephone (Boston)	135	135
Philadelphia Electric (Philadelphia)	26	25½
Postal Telegraph and Cables, common (New York)	82	78¼
Postal Telegraph and Cables, preferred (New York)	68	67¾
Western Union (New York)	61½	61¼
Westinghouse, common (New York)	75	73¾
Westinghouse, preferred (New York)	*120	120

*Last price quoted.

PERSONAL MENTION.

MR. JOHN K. PUNDERFORD, general manager of the Connecticut Company, has been promoted to vice-president of that company.

DR. EDWARD B. ROSA, of the Bureau of Standards, delivered an illustrated lecture on "Electrolysis and Its Mitigation" at the meeting of the Schenectady Section, American Institute of Electrical Engineers, on the evening of May 20.

MR. C. R. FAIRCHILD, district manager of the Delaware & Atlantic Telegraph & Telephone Company, Trenton, N. J., tendered an address on the growth and operation of the telephone industry, at the Bordentown (N. J.) Military Institute, May 15.

MR. J. W. GILLETTE, for six years manager of the Fort Smith (Ark.) Light & Traction Company, has been appointed sales engineer for the Electrical Engineers' Equipment Company, Chicago. Mr. Smith's many friends among the electrical profession will wish him success in his new position, for which he is so well qualified.

GEN. IRVING HALE, formerly in charge of the Denver office of the General Electric Company, was a recent visitor in Salt Lake City, Utah. General Hale has been in poor health for the past three years, and this trip was principally for the purpose of exchanging greetings with the men in the various offices formerly under his direction.

MR. H. S. SINES, assistant secretary of the Minerallac Electric Company, Chicago, aided in the capture of a team of runaway horses which were endangering scores of lives on one of Chicago's busiest thoroughfares on May 13. The horses were brought to a halt by a local police officer standing on the running board of Mr. Sines's motor car after an exciting chase of over a mile.

DR. EDGAR F. SMITH, provost of the University of Pennsylvania, and formerly vice-president of the American Electrochemical Society, was the recipient of an Elliott Cresson medal awarded by the Franklin Institute at its regular meeting in Philadelphia on the evening of May 20. Upon this occasion Dr. Smith made an address entitled "Scientists From the Keystone State."

MR. JACOB STRUB, has been appointed inside wiring inspector of Toledo, O., taking the position until recently held by MR. THOMAS D. McCOLL, resigned. Mr. Strub has disposed of his interests in the Whipple-Strub Electrical Company, and will devote all his time to his new duties. The firm name of the company he has left has been changed to Whipple Electric Company.

MR. CHARLES L. ESHLEMAN, general sales manager of the Adams-Bagnall Electric Company, of Cleveland, O., has resigned to become vice-president and general sales manager of the Union Metal Manufacturing Company, at Canton, O., which is making arrangements to build a new factory, doubling its capacity. The company now employs 50 men, and has found it necessary to have a large part of its work done in other foundries.

MR. F. W. HARVEY, JR., business manager of *Popular Electricity and the World's Advance,* has accepted the position of assistant manager for the Chicago Electrical Trades' Exposition Company. In this capacity Mr. Harvey will assist Mr. Homer E. Niesz, who has been in charge of the Chicago shows since their origin. Mr. Harvey is vice-president of the Chicago Jovian League, treasurer of the Electric Club of Chicago, and has a wide acquaintance among the electrical fraternity in Chicago.

MR. WARNER P. SAYRES, of the F. D. Lawrence Electric Company, MR. PARKER H. KEMBLE, manager of the electrical commercial department of the Union Gas & Electric Company, and several other men prominent in the electrical field in Cincinnati, were members of the trade excursion which the Chamber of Commerce of Cincinnati sent out through Southern Ohio and Indiana last week, covering a number of the principal towns in that section.

MR. WAYNE D. JONES, of Phoenixville, Pa., has tendered his resignation as electrical manager of the Spring City Institution for Epileptics and Feeble-Minded, effective May 20, when Mr. Jones will become the superintendent of the Phoenix Water Power Company, whose plant is situated at the Black Rock dam, at Phoenixville. Mr. Jones states that the new power company has entered into a 15-years contract to furnish power to the Schuylkill Traction Company, and that company is now erecting a pole line to Collegeville, in order to convey the power. It is expected that power will be furnished by June 1.

PROFESSOR V. KARAPETOFF, of the Department of Electrical Engineering, Cornell University, has recently completed an extended lecturing tour. His itinerary and topics were as follows:

May 9, Springfield, Mass., an address before the Eastern Association of Physics Teachers on the subject "Some Calculations in the Magnetic Circuit." May 11, Cleveland, O., an address before the engineering students of the Case School of Applied Science on "The Production of Revolving Magnetic Field." On the same day, a lecture before the Case School Chapter of the Society of Sigma Xi on "The Dielectric Circuit." On May 12, an address before the engineering students of Carnegie Institute of Technology, Pittsburgh, Pa., on the subject "Some Transient Electrical Phenomena." On the evening of the same day, a paper before the Pittsburgh Section, American Institute of Electrical Engineers, on the subject "The Preparation and Qualifications of a Teacher in Engineering." On May 13, he addressed the students of the University of Pittsburgh on the subject "Electrification of Steam Railroads."

OBITUARY.

MR. CHARLES A. BRAMHALL, one of the oldest employees of the Diehl Manufacturing Company, of Elizabeth, N. J., died at his home in Allendale, N. J., on May 7. Mr. Bramhall was well known to the electrical industry, especially in New York City, and his death is regretted by a host of friends and acquaintances.

DR. PAUL LOUIS TOUSSAINT HÉROULT, well known as the inventor of the type of electric furnace which bears his name, died in Paris on May 9. Dr. Héroult was born at Thury-Harcourt, France, on April 10, 1863, and studied in England as well as in his native land. In 1886 he attracted attention by his process for producing aluminum and devoted his time to the application of his inventions. He spent much time in this country in connection with this subject. His electric furnaces have been installed in a number of plants for the refining of steel. He was a member of the American Electrochemical Society, the Chemists' Club of New York, the Faraday Society, the Société des Ingénieurs and the American Institute of Mining Engineers.

NEW PUBLICATIONS.

MISSOURI COMMISSION. —The Public Service Commission of Missouri has issued its first annual report covering the year 1913. The report itself is rather short and covers the organization and activities of the Commission for the period named. The cases coming before the Commission are separately published and circular No. 25 has been issued giving a report on investigations of railroad accidents.

DATES AHEAD.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Indiana State Electrical Contractors' Association. Convention, Indianapolis, Ind., May 28-29. Secretary, George Skillman, Indianapolis, Ind.

American Institute of Electrical Engineers. 296th meeting, Pittsfield, Mass., May 28-29.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, J. C. Green, Portland, Ore.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

Minnesota Electrical Contractors' Association. Annual Convention, St. Paul, Minn., June 22.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 23-26.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-16. Secretary, G. H. Duffield, 40 Martin Street, Utica, N. Y.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, Albert Jackson Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Railway & Industrial Engineering Company announces that it has removed its works and offices from the Peoples Bank Building, Pittsburgh, to Greensburg, Pa.

M. B. Wheeler has opened offices in the Union National Bank Building, Houston, Texas, as electrical manufacturer's agent. The principal features of Mr. Wheeler's business will be: sales of everything electrical in merchandise and apparatus; advisory service pertaining to installations, wiring and illuminating problems; purchase and sale of electrical securities.

Stow Manufacturing Company, Binghamton, N. Y., has ready for distribution a folder illustrating seven of its compact electrically driven tools. These are the portable buffer, emery grinder, breast drill, two-spindle drill, tool-post grinder, bench grinder and the combination "Gee Whiz" machine for drilling, boring, grinding, buffing, etc. The Stow two-spindle drill is separately illustrated and described in bulletin No. 88.

Copeman Electric Stove Company, Flint, Mich., is sending out to central stations and dealers in electrical heating devices a folder called "The Price of Success." This calls attention to the Copeman line of electric family ranges and hot plates, the new automatic electric toaster, electric water heaters, etc. Special features of these appliances are pointed out as well as the advantages of electric cooking, which is called the twentieth-century cooking system.

H. W. Johns-Manville Company's May number of its monthly organ, *The J-M Power Expert*, published at its Cleveland, O., branch office, contains an interesting article by B. C. McClure on "Maintenance Cost—Efficiency and Economy—Safety First—Standardization." This article discusses these four live topics of the day from a new angle. The May issue also has a fine interior view and description of the Quarry Street station of the Commonwealth Edison Company, Chicago, in which all steam pipes are insulated with J-M Fire Felt.

Central Electric Company, 320-326 South Fifth Avenue, Chicago, Ill., has recently issued catalog No. 35, listing and describing automobile, motorboat and motorcycle supplies and accessories. This catalog contains 160 pages, a large number of which are devoted to electrical supplies such as lamps, spark plugs, foot warmers, speedometers, voltmeters, ammeters, horns, charging panels, garage lamps, storage batteries, switches, ignition coils, wires, etc. The catalog is well illustrated and prices and directions for ordering are included.

Hazard Manufacturing Company, Wilkes-Barre, Pa., has issued price list No. 54 of Hazard rubber-covered wires and cables. This list is very comprehensive, covering 28 pages of data and useful information. Among the wires and cables listed are solid, solid duplex, and stranded conductors (ranging in the latter case from No. 14 to 2,000,000 circular mils), light and heavy fixture wires, telephone wires, and a variety of special cords and cables. Additions for special insulations or coverings are given, also full data on freight additions. All of the wire lists are given for base prices ranging from 13 to 20 cents. Copies of this price list may be had on request to the company.

Rochester Lighting Company, Rochester, Pa., has been organized and has opened studios in the Marquart Building. The company carries a full line of residence, store and office lighting equipment, and is also prepared to manufacture and install electric signs for both plain and decorative effects with the most modern flasher equipments. Leon S. Malone, has active management of the business, and Charles Z. Fogel, connected with the Phoenix Glass Company, is acting in an advisory capacity. The new company has already listed a large number of new homes and business blocks, among them the Majestic Theater in Rochester, and with the prospects of a good building season will no doubt push rapidly to the front.

The Yost Electric Manufacturing Company, Toledo, O., announces that the infringement suits brought against it and one of its customers by the General Electric Company in Ohio and in New York have been dismissed. The controversy arose over the alleged infringement of the Sargent patent covering the retaining means of the insulating lining in the cap of a brass-shell socket. In both cases the courts held that the Yost construction did not infringe. Both cases, however, were appealed. The appeal of the New York case resulted in the affirmation of the finding of the lower court. Subsequently the appeal of the Ohio case was dismissed by agreement of the appellant. The Yost Company has made use of this construction since 1902.

Sprague Electric Works of General Electric Company, New York City, has recently issued a number of pamphlets, among which is No. 905, entitled, "Sprague Electric Hoists." This pamphlet illustrates and describes electric cranes of various sizes ranging from one-half to six tons in capacity. Numerous views of installations are included, together with a table of ratings, capacities and weights. Pamphlet No. 952 is devoted to theatrical devices such as strip, proscenium, foot and border lights. Numerous line drawings add to the value of this pamphlet. Other pamphlets on theatrical appliances which have recently been issued, are Nos. 950, 951 and 953, illustrating and describing plug connectors, stage floor and wall pockets, and iris-shutter color disks respectively. All of these pamphlets are illustrated by half-tones and line drawings. Pamphlet No. 331 is devoted to a brief description of electric fans for private and commercial purposes. Pamphlet No. 441 describes and illustrates watertight floor outlet boxes.

Santo Manufacturing Company, Philadelphia, Pa., announces that it has purchased the patents and manufacturing facilities of the Kellar Manufacturing Company. A. H. Boyd, manager of the Philadelphia office of the Fort Wayne Electric Works of General Electric Company, has accepted the position of general manager and treasurer of the new company. Mr. Boyd began work in the construction department of the Fort Wayne Electric Works in 1899, and superintended the installation of many large and important light and power plants all over the country. In 1907 he was transferred to the sales organization and shortly after that was promoted to manager of the power-sales department. In 1910 he was sent to Philadelphia to take charge of the district sales office. During the past nine months he has acted as receiver for the creditors of the Kellar Manufacturing Company, and when the Santo company was organized to take over the factories, equipment and business of the Kellar Manufacturing Company, he was offered the position as general manager and treasurer. The same engineering and manufacturing organization has been retained, and the company will continue to manufacture and market Santo vacuum cleaners.

General Electric Company, Schenectady, N. Y., has recently received the following among a multitude of orders for electric power equipment: Great Falls Power Company, Butte, Mont., four 10,000-kilowatt waterwheel-driven generators, two 500-kilowatt generators, nine 6,000-kilowatt water-cooled transformers, nine 360-kilovolt-ampere reactances, switchboard and accessories. Thompson Falls Power Company, Butte, Mont., two 6,250-kilowatt waterwheel-driven generators, two 500-kilowatt generators, four 3,750-kilowatt water-cooled transformers, switchboard and accessories. Great Western Power Company, San Francisco, Cal., two 150-kilowatt three-unit motor-generator booster sets, switchboard and accessories. American Iron & Steel Manufacturing Company, Lebanon, Pa., a 1,500-horsepower induction mill-type motor with sectional control equipment. Bethlehem Steel Company, South Bethlehem, Pa., nine motors ranging from 10 to 50 horsepower; also two additional 125-horsepower and two 150-horsepower induction motors. Riter-Conley

Manufacturing Company, Pittsburgh, Pa., 32 motors of 10 and 25-horsepower capacities. Hubbard Steel Foundry Company, East Chicago, Ind., two 100-kilovolt-ampere synchronous motors with five-kilowatt exciters and accessories. John P. Squire & Company, Cambridge, Mass., a 300-kilowatt alternating-current generator, three 40-kilowatt transformers, a Tirril regulator and a six-panel switchboard. Michigan Limestone & Chemical Company, Rogers City, Mich., a 1,250-kilowatt Curtis turbogenerator with motor-generator exciter set, a 200-horsepower induction motor, ten motors ranging from 20 to 75 horsepower, transformers and switchboard. Edward Ford Plate Glass Company, Toledo, O., a 13-ton electric industrial locomotive and transfer car equipment. Braender Rubber & Tire Company, Rutherford, N. J., five 100-horsepower induction motors. Hebron Fire & Pressed Brick Company, Hebron, N. D., a 300-kilowatt Curtis turbogenerator, a 120-kilowatt generator with exciter, 10-kilowatt transformer, 19 motors ranging from 7.5 to 50 horsepower, and a switchboard. The J. C. Hubinger Brothers Company, Keokuk, Iowa, a 1,270-horsepower synchronous motor with 18-kilowatt exciter and switchboard. Quaker Oats Company, Chicago, Ill., three 75-horsepower and two 100-horsepower motors. Webster Manufacturing Company, Tiffin, O., six motors ranging from 7.5 to 100 horsepower. Oneida Community, Limited, Sherrill, N. Y., 104 motors ranging from 3 to 20 horsepower. Mutual Chemical Company of America, Baltimore, Md., eight motors ranging from 5 to 75 horsepower. Robert Gair Company, Brooklyn, N. Y., 57 additional motors ranging from ½ to 3.5 horsepower, with controllers and accessories. Huetteman Creamery Company, Detroit, Mich., two 300-horsepower induction motors and three 200-kilowatt transformers.

Record of Electrical Patents.

Issued by the United States Patent Office, May 12, 1914.

1,096,020. **Safety Trolley Wheel.** J. A. Burton, Covington, Ky. A trolley wheel with side plates hinged to wheel shaft and bent so as to overhang the trolley wire and to automatically open when passing a trolley-wire support.

1,096,048. **Magneto-Generator.** J. L. Milton, Tiffin, O. An ignition generator having an oscilating armature designed to be driven in one direction by engine shaft and to return to its initial position automatically.

1,096,061. **Electropneumatic Control Apparatus.** W. M. Scott. Philadelphia, Pa. A pneumatically operated circuit-breaker.

1,096,065. **Electric Tuning Device.** E. G. Stalnaker, Chicago, Ill., C. W. Stalnaker, guardian, assignor to C. W. Hoff, Chicago, Ill. A rotable tuning coil for wireless-telegraph apparatus so wound that a stationary brush makes contact with successive turns as coil is turned.

1,096,085. **Electrolytic Process and Apparatus.** C. White, London, England. Process for the electrolysis in non-diaphragm cells of sodium chloride and other solutions evolving gas at the anode comprising the application of local heat and special exhausting means.

1,096,108. **Telephone System.** B. G. Jamieson, Chicago, Ill. Includes means for branch exchanges to indicate at central exchange the conditions of subscribers' lines.

1,096,109. **Circuit Controller.** A. A. Kent, Philadelphia, Pa. Ignition means for a four-cylinder internal-combustion engine involving the use of two induction coils each of which is connected to two cylinders.

1,096,127. **Telephone Receiver.** A. Rosenberg, London, England. A watch-case telephone receiver in which the air gap is capable of being varied by means of an indicating-adjusting screw fastened to pole of magnet.

1,096,136. **Electric Signal and Recording System.** A. L. Sohm, assignor to Sohm Electric Signal & Recording Co., Spokane, Wash. A printing-telegraph apparatus.

1,096,138. **Electric Connector.** J. C. Stearns, Worcester, Mass. A plug-socket device in which the plunger is held by a compressed spring.

1,096,142. **Ethereal-Wave Responsive Device.** E. Weintraub, assignor to General Electric Co. A crystal detector for receiving wireless messages one member of which is composed essentially of boron.

1,096,151. **Spark Indicator.** C. D. Bremer and J. L. Mooney, Milwaukee, Wis. Includes spark gaps with short-circuiting switches.

1,096,153. **Telephone Transmitter.** E. B. Craft, Hackensack, N. J., assignor to Western Electric Co., New York, N. Y. Covers details of contact construction.

1,096,155. **Firing Mechanism of Breech-Loading Guns.** A. T. Dawson and G. T. Buckham, assignors to Vickers Limited, Westminster, England. Covers details of arrangement of electrical firing mechanism.

1,096,158 and 1,096,159. **Apparatus for Testing Castings.** E. I. Dodds, Central Valley, N. Y. An electromagnetic means for testing castings.

1,096,205.—Spot-Welding Electrode.

1,096,175. **Electric Transmission of Intelligence.** I. Kitsee, assignor to American Telephone & Telegraph Co. Special cable construction having shield conductors for each conductor, the shield conductors forming a closed circuit transposed at intervals.

1,096,182. **Transmission System.** D. D. Miller, assignor to Western Electric Co. Includes automatic control of resistances connected to polarized relays in telegraph systems.

1,096,205. **Electrode-Point for Spot-Welding Machines.** A. C. Taylor, assignor to The National Electric Welder Co., Warren, O. A removable welding point for spot welding, internally tapered to receive a pointed welding electrode. (See cut.)

1,096,215. **Signal Device.** G. L. Barrett, Springfield, O. An electric bell with an automatic indicating circuit-breaker device.

1,096,229. **Method of and Apparatus for Testing Castings.** E. I. Dodds, Central Valley, N. Y. A modification of 1,096,158 and 1,096,159.

1,096,243. **Secondary Winding for Induction Motors.** T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Rotor bars have laterally-bent touching ends and short-circuiting rings are shrunk upon the two ends of the structure.

1,096,276. **Gas-Igniter.** H. B. Steele, Boston, Mass. Covers details of arrangement of contacts in a divided jet burner.

1,096,285. **Illuminated Head-Covering.** F. S. Collier, Fremont, O. Includes the use of a miniature incandescent lamp.

1,096,287. **Adjustable Mounting of Armatures of Electromagnets.** E. B. Craft, assignor to Western Electric Co. A fork device for varying the distance between the magnetic poles and an armature.

1,096,289. **Electric Resistance Unit.** O. Dale, New York and H. A. Frederick, Tuckahoe, N. Y. A reflexed resistance unit so folded as to provide an open but compact construction.

1,096,321. **Electric Furnace.** A. Scott-Hansen, assignor to Norsk Hydro - Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Covers arrangement of air passages.

1,096,390. **Osmo-Anticathodic Vacuum-Regulator for X-Ray Tubes.** C. Regaud, Lyon, France. Includes means for conducting gas to osmotic anode.

1,096,411. **Arc-Lamp.** A. Blondel and G. Dobkevitch, assignors to General Electric Co. Covers details.

1,096,414. **Electric Furnace.** W. D. Coolidge, assignor to General Electric Co. An aluminum-tube furnace for treating metallic lamp filaments.

1,096,422. **Cap and Shell Fastening for Lamp Socket Casings.** E. H. Freeman, Trenton, N. J. Covers details for fastening cap and shell.

1,096,434. **Telephone-Transmitter Cut-Out.** A. R. Langdon, Hartford, Conn. Has a switch mechanism in the supporting arm.

1,096,440. **Lamp.** G. C. Lynch, New York, N. Y. A table electric lamp with a swivel arm.

1,096,448. **Electric Window Sign.** W. J. Murphey and O. R. Burgess, Newcastle, Ind. A transparent window sign supported on a bracket.

1,096,457. Connector Stand. F. J. Ravlin and J. Lofgren, Chicago, Ill. Comprises a hollow stationary standard and a table containing pull sockets.

1,096,470. Automatic Controller for Electric Circuits. L. Stern, Philadelphia, Pa. A float-operated signal device.

1,096,475. Electrically Heated Implement. C. Van Glahn, assignor to National Electric Utilities Corporation, New York, N. Y. An electric soldering iron containing electric heating coil.

1,096,484. Holding Device for Telephone Receivers. K. H. Atherton, Carson City, Nev., and M. N. Rodgers, Chicago, Ill. A vertical telephone-receiver support fastened to receiver hook.

1,096,485. Electric Switch. T. E. Barnum, assignor to The Cutler-Hammer Mfg. Co. A flywheel-operated switch.

1,096,506. Electric Welding Apparatus. E. E. Haskin, New York, N. Y., assignor of one-half to W. E. Haskin. A mandrel for electric welding, having an anvil and an electric contact.

1,096,534. Electric Lantern for Vehicles. L. E. Hoover, Wooster, O. An adjustable electric lamp.

1,096,536 Automatic Synchronizer Indicator for Clocks. E. A. Hummel, assignor to A. L. Haman, St. Paul, Minn. Includes magnetic synchronizing means and indicator.

1,096,562. Traction Harvester. C. F. Radatz, Kenosha Heights, Wis. Has electric-motor drive.

1,096,587. Electric Accumulator. M. L. Ashbaugh, Anderson, Ind. Has horizontal electrodes with spacing elements.

1,096,601. Muffler for Electrostatic Machines. L. C. Charbonneau, Brooklyn, N. Y. A combination of two conical members through which the electrodes pass.

1,096,618. Conduit Wire Fishing Reel. G. Russell, assignor to W. C. Schmitt, Portland, Ore. A drum device with restraining rollers. (See cut.)

1,096,625. Ignition System for Internal Combustion Engines. A. C. Gundy, Upland, Cal., assignor of one-half to M. H. Hay. An electromagnetic switch controlling circuits from timing device.

1,096,627. Take-Down Apparatus for Handling Glass Cylinders. H. F. Hitner, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. A motor-operated tilting frame with an automatic circuit-opening device to prevent overtravel.

1,096,656. Tower Wagon. E. R. Whitney, assignor to Commercial Truck Co. of America, Philadelphia, Pa. Telescoping part of tower is motor operated.

1,096,673. Elevation-Controlled Firing Apparatus for Guns. E. Bourdelles, Paris, France, assignor of one-half to Compagnie des Forges et Aciéries de la Marine et d'Homécourt. Has gravity-controlled electromagnetic means operated automatically when gun has correct elevation.

1,096,676. Telephone Receiver. S. G. Brown, London, England. Diaphragm is supported at the center of a reed.

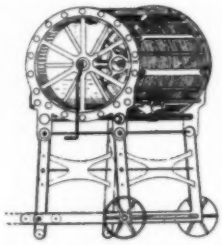
1,096,677. Telephone Transmitter. S. G. Brown. Diaphragm thickness decreases towards its periphery.

1,096,680. Electric Clock. E. E. Clement, Washington, D. C. Electric striking means for clocks controlled by a commutator in synchronism with clock movement.

1,096,681. Time-Control Element for Electric Clocks. E. E. Clement. Comprises a pendulum, oppositely disposed contacts and interlocking relays connected to opposite contacts.

1,096,682. Electrically Illuminated Clock. E. E. Clement.. Has radial segments in which lamps are placed to denote position of hands.

1,096,691. Apparatus for Taking Photographs with Röntgen Rays. F. Dessauer, Aschaffenburg, Germany. X-ray tube is in secondary of a transformer supplied with direct-current, the primary being suddenly broken upon blowing a main fuse.



1,096,618.—Wire Fishing Reel.

1,096,692. Apparatus for Making Instantaneous X-Ray Photographs. F. Dessauer. A modification of 1,092,691, employing an electrolytic interrupter.

1,096,699. Connecting Clip for Electrical Conductors. J. G. Elkin, New York, N. Y Has spring-pressed jaws for engaging binding post. (See cut.)

1,096,716. Starting Device for Explosive-Engines. T. Herbig, Hornbrook, Cal. Includes means for giving electric ignition on starting engine by injecting gas in cylinder by pump.

1,096,717. Oscillator for Wireless Transmission. C. D. Herrold, San Jose, Cal. Sparking electrodes are of tubular shape and immersed in insulating fluid.

1,096,726. Pocket Lantern. W. Knopf, Berlin, Germany. A pocket lantern of revolver shape, the lamp being operated by the trigger.

1,096,729. Automatic Block System. H. G. Kurtzhals, Somerset, Pa. A track-operated electric-semaphore signal device.

1,096,699.—Connector Clip.

1,096,741. Trolley Switch. J. G. Munson, Cedar Rapids, Iowa, assignor of one-third to J. D. Wardle and one-third to E. F. Winslow. Auxiliary trolley wire is grooved to shape of main wire.

1,096,743. Pneumatic Renovating Machine. A. T. Noé, assignor to Electric Renovator Mfg. Co., Pittsburgh, Pa. Has electric-motor drive.

1,096,747. Telegraph Receiver. A. Parodi, New York, N. Y. Electromagnets carry pen engaging with tape.

1,096,751. Negative Electrode for Alkaline Secondary Batteries. H. P. R. L. Pörscke and J. A. E. Achenbach, Hamburg, Germany. Process of forming electrodes consisting of depositing a metal-ammonium compound, the escaping gas giving the metal a porous nature.

1,096,754. Electric Regulator. F. E. Ricketts, Baltimore, Md. A vibrating field-regulating system.

1,096,755. Automatic Electric Regulator. F. E. Ricketts, Baltimore, Md. A modification of 1,096,755.

1,096,765. Method of Collecting Particles Present in an Ionized Medium. W. W. Strong, Mechanicsburg, Pa. Includes a magnetic depositing device.

1,096,766. Railway Safety Appliance. M. Thomas, Rifle, Colo., A. Thomas, guardian, assignor of one-third to M. S. Thomas and one-third to F. M. Gillum. A stationary track-operated lamp for illuminating railway curves.

1,096,778. Electric Clock. E. E. Clement, Washington, D. C. Covers the wiring and arrangement of an electric sign representing a clock.

1,096,779. Electric Clock. E. E. Clement. A clock-operated controlling system for 1,096,778.

1,096,794. Automatic Stop Mechanism for Phonographs. A. Nielsen, New York, N. Y. An automatically operated electromagnetic brake.

1,096,800. Rheostat for Toy Electric Railways. F. Dangel, assignor to Nürnberger Metall & Lackierwarenfabrik vorm. Gebrüder Bing A. G., Nuremberg, Germany. Rheostat forms part of railway tie.

Patents Expired.

The following United States electrical patents expired May 18, 1914.

582,615. Electric Lock. H. Bezer, New Rochelle, N. Y.

682,640. Machine for Forming Armature Coils. G. A. Grisell, Madison, Wis.

682,649. Electric Advertising and Display Apparatus. J. L. Killmer, New York, N. Y.

582,663. Electric Controller. W. H. Morgan, Alliance, O.

582,664 and 582,665. Electric-Arc Lamp. J. A. Mosher, Chicago, Ill.

582,694. Electric Searchlight. S. W. Rushmore, Brooklyn, N. Y.

582,698. Electric Rail Bond. G. H. Scott, Worcester, Mass.

582,713. Toll Apparatus for Meters. F. M. Archer, New York, N. Y.

582,714. Telephone Toll Apparatus. F. M. Archer.

582,721. Electrode. J. A. Deuther, Boston, Mass.

582,722. Method of and Apparatus for Preventing Formation of Arcs when Opening Circuits. T. Von Zweigbergk, Cleveland, O.

582,773. Telephony. J. Absterdam, New York, N. Y.

582,840. Electric Switch. E. H. Wright, Chicago, Ill.

582,862. Circuit-Breaker for Trolley Wires. C. Hoff, Cincinnati, O.

582,882. Trolley for Electric Railways. S. H. Short, Cleveland, O.

582,883. Brush-Holder. S. H. Short.

582,884. Brush-Holder for Dynamos or Motors. S. H. Short.

582,889. Automatic Electric Gate. J. M. Williams and T. P. Kinney, Danville, and H. W. Kinney, Lynchburg, Va.

582,910. Electrical Conduit. J. J. Groshans, Buffalo, N. Y.

582,913. Telephoning from Cars. M. Garl, Akron, O.

582,918. Electropneumatic Organ Action. H. E. Hobbs, Weston, Mass.

582,936. Electrode. W. Majert, Falkenberg, Germany.